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THE VEGETATION OF RHODESIAN MANICALAND

(With Plates 12—35)

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I. Summary of previous work.

Rhodesian vegetation, even in very general terms, remained unknown until well into the 19th century; the accounts of previous explorers being vague and usually anecdotal. Thus, although Kirk and Meller (Oliver, 1868) when attached to Livingstone's first and second expeditions and Peters (1863) in a journey to Mocambique and the Zambesi valley had made collections just north and east of Rhodesia as early as 1860, it was not till 1881 (Oates, 1881) that the first account of a Rhodesian collection appeared. From that time collections began to come in, most of which are quoted in vol. iv and onward of the Flora of Tropical Africa (23). In 1911 appeared the first account of a piece of Rhodesian vegetation, when the collections and explorations of C. F. M. Swynnerton were reported on in the Journal of the Linnaean Society of London. (Rendle, 1911.)

Swynnerton collected and explored chiefly in the region known traditionally as Gazaland, and, of that, chiefly the Rhodesian portion. He did not clearly distinguish between the dominant communities and types, but his records are very full and usually enable one to assign due place in the vegetation to the species he records.

Eyles' work (1916), while materially benefitting the study of vegetation, necessarily omitted all but the briefest reference to plant communities, and it was not till 1931 that a comprehensive account of the vegetation types in Southern Rhodesia appeared from the pen of J. S. Henkel, then Chief Forest Officer (Henkel, 1931). Including an excellent map of the distribution of the vegetation types, this paper was of generous scope and forms the sine qua non of further vegetational studies. Ten major vegetation types were recognised.

Further systematic investigations were carried on by Thor C. E. Fries and his associates, particularly round Mt. Inyangani (Weimarck, 1932). The unfortunate death of Fries curtailed the field work, but the collections continue to be named from Lund.

II. Definition and Political History of area.

The area of Rhodesian Manicaland has been defined in a previous paper (Gilliland, 1938).

The name, like that of Gazaland, is a traditional one, though it has become less used in more recent times. Its origin is lost in antiquity (Hole, 1926), the earliest records being of one Vasco Fernandes Homen to the gold diggings of Manica in the sixteenth century, when, as far as is known, it was a province of the legendary Empire of Momomotapa.

At the time of the British Occupation, after Mashonaland had been occupied by the Pioneer Column in 1890 under the Rudd Concession, Rhodes sent Colquhoun to treat with Umtasa, a chief, resident east of the Sabi river and beyond the influence of Lobengula's impis, and endeavour to obtain a similar concession from him. This he did successfully and thereafter Umtasa's territory came under British Protection. This treaty was worded " a treaty or alliance made between the Manica nation and the Government of Queen Victoria." From this and from the fact that the dialect spoken is termed chiManyika, the boundaries may be taken as roughly those of the sphere of influence of the present Umtasa in what is now British Territory.

III. Inhabitants.

(*a*) **Present.**—The region is at present inhabited by European settlers, confined for the greater part to the near neighbourhood of the main roads and townships. The number of them cannot greatly exceed a thousand.

Together with the European settlers, there are their farm labourers, mostly native, and a large population of natives in native reserves ; the Makoni, Manyika, Umtasa north, Umtasa south and Manga reserves with a population of about 10,000.

(*b*) **Past.**—That Stone-Age Man inhabited the whole of the continent at some time in the past is the opinion generally held amongst prehistorians. (Theal, 1910 ; van Riet Lowe, 1937 ; Holmes.) Although we may feel certain that stone-age Man was familiar with fire, the present central African pygmies and the remnants of the Bushmen—not cattle-owning peoples—suggest that he was not concerned in the destruction of forest for grazing or hut-building purposes. Such destruction was probably first caused by the iron-age (Bantu) migration from the north. The Hottentots are generally held (Theal, 1910) to have migrated down the west side of the continent, and thus do not come into the picture here. The time of the first iron-age migration across the Zambesi is usually put at no more than a thousand years ago (Theal, 1924). Subsequent to the time of the first migration there is much evidence of habitation in the form of " slave pits " (Mason, 1933) and the van Niekerk ruins in Manicaland. These dwellers are survived or were followed by the present inhabitants.

Thus for a period extending over perhaps one thousand years people have been present in this region, acquainted with, and commonly using, fire and axe to destroy woody vegetation in favour of pasture and arable land.

IV. Geology of the region (Phaup).

(*a*) **Schists.**—Practically the whole of the rocks in Manicaland are of Precambrian age, the oldest belonging to the Archaean Basement Schists of Rhodesia, which are probably equivalent to the Swaziland System of South Africa. They form a long narrow belt stretching over 70 miles in a west-south-westerly direction from just north of Umtali past Odzi, to the Sabi Native Reserve beyond the Sabi river. Where the belt crosses the border, it is about 5 miles wide and is composed of two marginal lines of hilly country separated by a broad valley of comparatively flat country. The marginal hills are formed of serpentine and talc-schist derived from ultrabasic rocks, and greenstones formed from basaltic rocks. These rocks are more highly metamorphosed than the younger sedimentary rocks, chiefly arkoses, greywacke and phyllites which form the flatter central portion of the belt. Towards the west the belt of schists narrows to about a mile across and the greenstone and serpentine hills converge to meet near the Odzi river, and from there westwards they compose the whole belt.

(*b*) **Granites.**—By far the greater part of the district is composed of massive and gneissic Precambrian granodiorite, known locally as granite. It is younger than the basement schists and is intrusive into them and in many places contains large half-digested inclusions of schist which colour the soil red locally.

(*c*) **Sandstone.**—In the northern part of Manicaland near Inyanga is a strip of flat bedded sediment about 35 miles long and 5 miles wide. In many ways this resembles the Umkondo System sediments of the Melsetter district, and is probably of the same age as the Waterberg sediments farther south.

(*d*) **Dolerites.**—Intrusive into all the above are large dykes and sills of dolerites of uncertain age. They occur everywhere but are best known around Inyanga and the railway line, where they form patches of rich, red clayey soil known locally as " diorite " soil.

V. Topography.

Rhodesia consists in the main of a plateau at an average altitude of ± 4,500 ft. bounded in the north and on the south by the deep river valleys of the Zambesi and Limpopo respectively. The plateau falls rather steeply to these two valleys which constitute the main drainage channels of the country. On the west the plateau falls slowly into the Kalahari desert, and on the east rises somewhat steeply to the eastern escarpment which has an average altitude of about 5,300 ft., but with peaks rising to 9,000 ft.

Manicaland consists of a portion of the plateau more or less triangular in shape. The apex lies at Rusape and the base is formed by the escarpment running from the Xmas Pass, north of Umtali, along the Inyanga Range and containing two peaks of note in Mt. Nuza, 6,666 ft. and Mt. Inyangani, 9,000 ft. Finally there is the narrow portion on the east, dropping down to 2,000 ft. within five miles in some places, which merges into the adjoining Portuguese Plain.

VI. Drainage.—There are two main watersheds in the area :—

(*a*) **The Escarpment.**—This runs approximately north and south, and the rivers drain from it in both easterly and westerly directions. Draining east are the Numkwarara, the Honde and the Pungwe rivers. The Numkwarara and Honde join the Pungwe which flows into the Indian Ocean at Beira.

Draining north-east is the Gaerezi river flowing into the Ruwenya and then the Mazoe which ultimately joins the Zambesi.

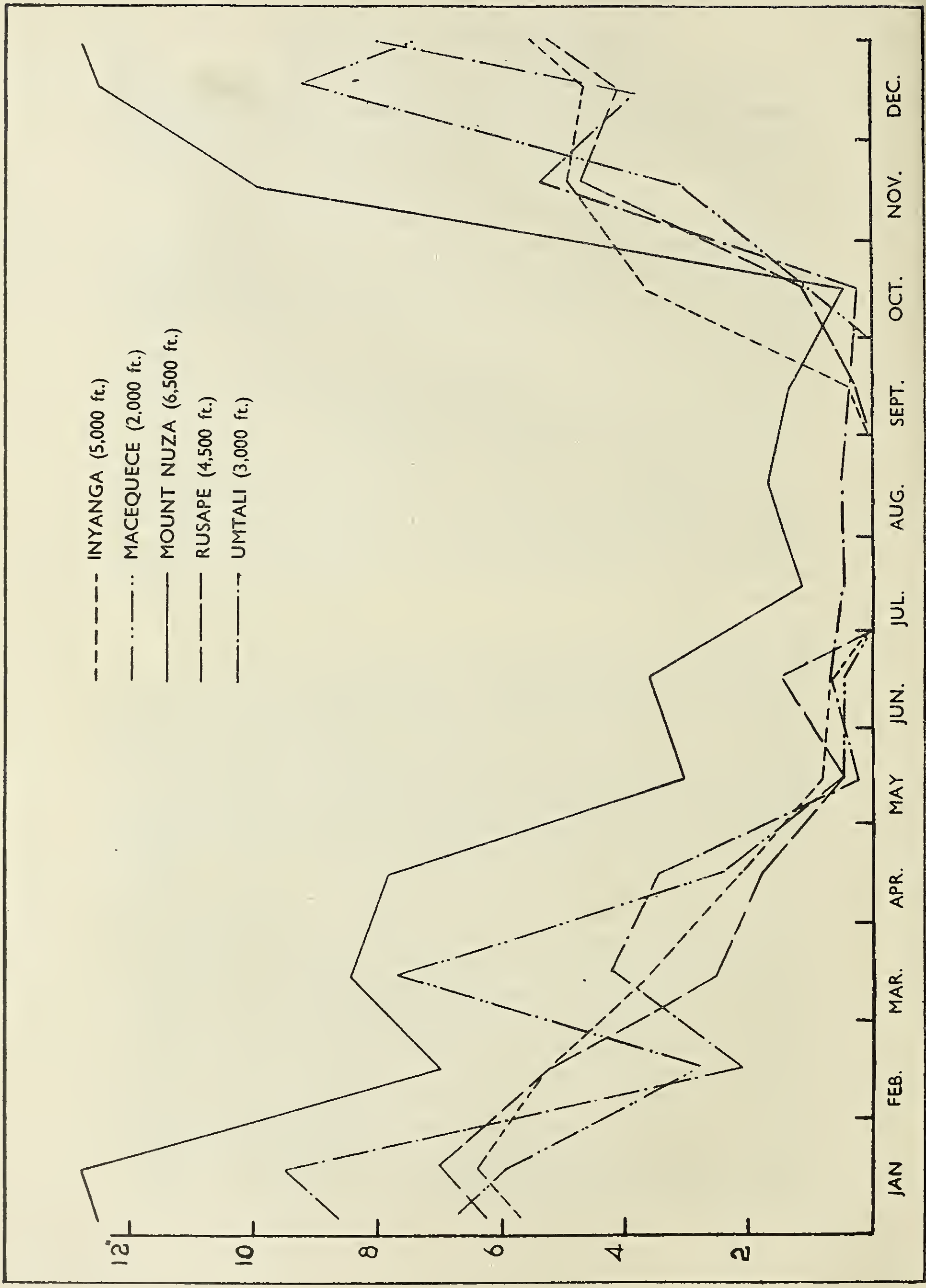
Draining west are the Odzani and Chinyika rivers.

(*b*) **The Plateau.**—The plateau, which is part of the general Rhodesian plateau, acts as a watershed between the Zambesi and Limpopo drainage systems, and while we find the Odzani turning south to flow into the Sabi, which drains into the Indian Ocean somewhat north of the Limpopo, the Chinyika turns north and east to flow into the Gaerezi and thence into the Zambesi.

VII. Climate (25).

The meteorological records from several stations within the region, together with some others from neighbouring stations, have been examined. Those for the year 1934 are analysed in the form of graphs (figs 1—4). These data may be taken to represent the general climate, though figures for other years may differ in detail. It will be seen that as might be expected, mean maximum and mean minimum temperatures decrease with increasing altitude and that rainfall and relative humidity increase with increasing altitude. The position of the station in relation to the escarpment, however, should be carefully borne in mind. Thus Mt. Nuza is on the summit of the escarpment. Umtali likewise but at a very much lower altitude, Macequece to the east and Inyanga and Rusape to the west of the escarpment. The climate is thus seen to be fairly uniform with rain-bearing winds blowing from the east. Differentiation is, in general, in terms of altitude and distance from the escarpment to the west.

Three " seasons " can be generally distinguished, a hot wet " rainy season," a cool dry " winter season " and a hot dry " spring season." To the west of the escarpment at Rusape a further dry warm " autumn season " is beginning to be differentiated.


INYANGA (5,000 ft.)
MACEQUECE (2,000 ft.)
MOUNT NUZA (6,500 ft.)
RUSAPE (4,500 ft.)
UMTALI (3,000 ft.)
12
10
8
6
4
2
JAN
FEB.
MAR.
APR.
MAY
JUN.
JUL.
AUG.
SEPT.
OCT.
NOV.
DEC.

VIII. The Vegetation.

(A) Introductory.—Within this region, and indeed elsewhere in Rhodesia, Henkel's map has been found to be accurate (Henkel, 1931).

The vegetation falls naturally into three zones, as it stands at present, corresponding to mean annual temperature differences of about 5 degrees. These differences are directly traceable to altitude.

Differentiation is further caused, west of the escarpment, by a progressively smaller rainfall in the westerly direction, and had Manicaland extended much further west than Rusape, a further climatic zone would probably have had to be discussed. As it is, this slow lessening of the rainfall from east to west makes the distinction between the three zones on the west face of the escarpment anything but definite.

While classical phytogeographic papers have been content to describe the vegetation as at present in situ (Clements, 1902 ; Engler, 1908), the trend to-day is to interpret existing vegetation in terms of genetic relationship to that ultimately possible under the prevailing climate. Such an ultimate vegetation is termed a **climax.** Much patient field study, on the continents of America amd Africa particularly, has shown (Clements, 1904, 1916 ; Phillips, 1931) that the climax is conditioned only by the climate, and that the other vegetation types present should be interpreted as developmental or **seral** to the climax. In general three major **seres** are recognised ; from moist sites or the **hydrosere** ; from arid sites or the **xerosere** and from disturbance of the climax or secondary succession stages. The further nomenclature for the more or less stable stages in the vegetation prior to the climax or relict from a previous climate is given by Clements (1936). The ideas inherent here are discussed later in this paper.

The Three zones noted above are :—

i. **The muPfuti Zone.** Lying between 2,000 ft. and 3,500 ft.
ii. **The muTsatsa Zone.** Lying between 3,500 ft. and 5,000 ft. (±).
iii. **The Mountain Zone.** Land above ±4,500 ft.

(B) The muPfuti Zone. (*Brachystegia spp. of B. flagristipulata type.*)

This is the smallest zone in terms of area and occurs in two portions :

(1) **West of the escarpment.**—To the west of the escarpment it forms a belt about five miles wide in the valley of the Tsungwesi, turning north-east to terminate at a point almost due north of Odzi. Meteorological records are unfortunately not available for this area, the nearest in similar vegetation being many miles to the north-west at Mt. Darwin.

(2) **East of the escarpment.**—On the eastern side of the escarpment the muPfuti is found along the eastern border as a narrow strip, scarcely three miles wide, as far south as Mt. Panga and extending up into the

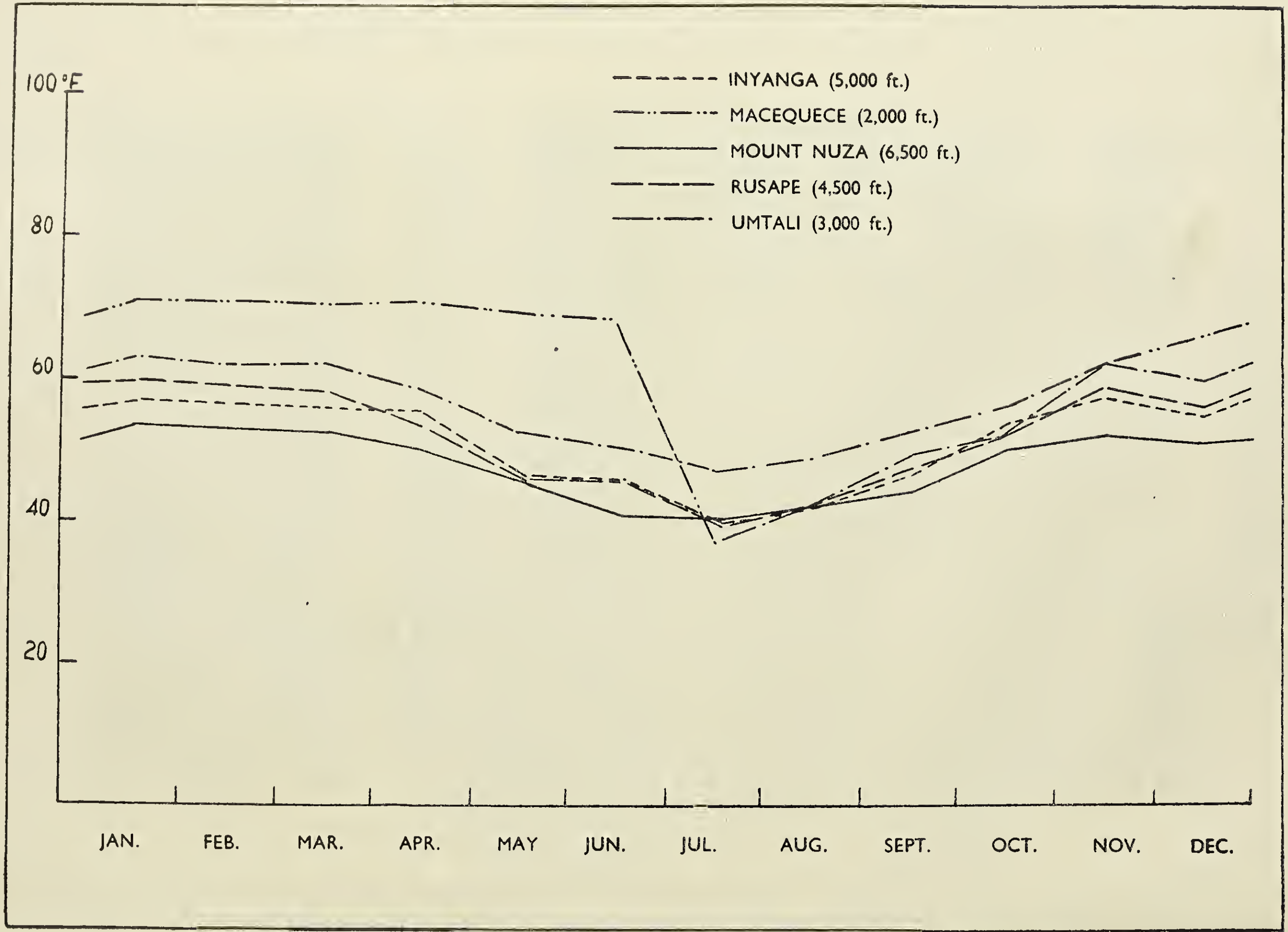


Fig. 2.—Graph showing the variation of relative humidity with locality and season in Manicaland.

valleys of the Pungwe, Honde and Numkwarara. Again unfortunately there is no meteorological station, but figures are available for Macaquece about 20 miles east of Umtali.

Biotic factors.—Man. In the Honde and Numkwarara valleys dense native populations exist. These carry on a kind of " shifting agriculture." Tree-bearing land is felled and burnt over and subsequently cultivated by hoe and cropped until the soil is exhausted. New tree-bearing land is treated similarly and the old left. That fire (probably man-made) has been active for a long period of time, as noted by Henkel, is indicated by the numerical preponderance of fire-resisting trees. The succession following on native cultivation is noted below.

Animals. Adequate animal studies were not made. There can be no doubt however that mammals and birds play an important part in the development of vegetation here, chiefly through distributing seed.

Chief communities and succession.

i. **The Climax.**—Taking into consideration the fire-resistance, open canopy, ability to thrive on rocky immature soils and potential deciduousness of the muPfuti, one feels satisfied that the open savanna type of woodland, of which it is characteristic, is not a climax vegetation in this area. Particularly is this conclusion emphasised by an examination of the riverine vegetation which frequently develops into evergreen, storied forest. It is suggested that the climax is evergreen forest of tropical type, such as is noted for the muTsatsa zone, of definite structure and with the genus *Khaya* as a prominent member. Unfortunately the writer has not been able to discover such a climax forest type in Rhodesia or in Portuguese East Africa in a comparable climatic zone, nor is there reference in literature to one. Perhaps the forest of the Amatongas in Portuguese East Africa may be a relic of just such a type, but this needs confirmation. (26.)

ii. **Present communities.**

Primary succession.—Primary succession stages, other than those directly related to the hydro- or xero-seres, are not easy to find. Perhaps the *Albizzia* dominated forest of small stature on the northern slopes of the Pungwe-Honde confluence represent such a stage.

Secondary succession.

The pioneer forb-short grass stage.—This is a series of communities on old lands and other disturbed areas. Occasional geophytes are present such as *Pentanisia variabilis*, with numerous species of grass, sedge and others, e.g. *Panicum*, *Eragrostis*, *Perotis indica*, *Pogonarthria squarrosa*, *Cyperus*, *Bulbostylis*, *Phyllanthus*, *Oxalis*, *Biophytum*, *Triumfetta*,

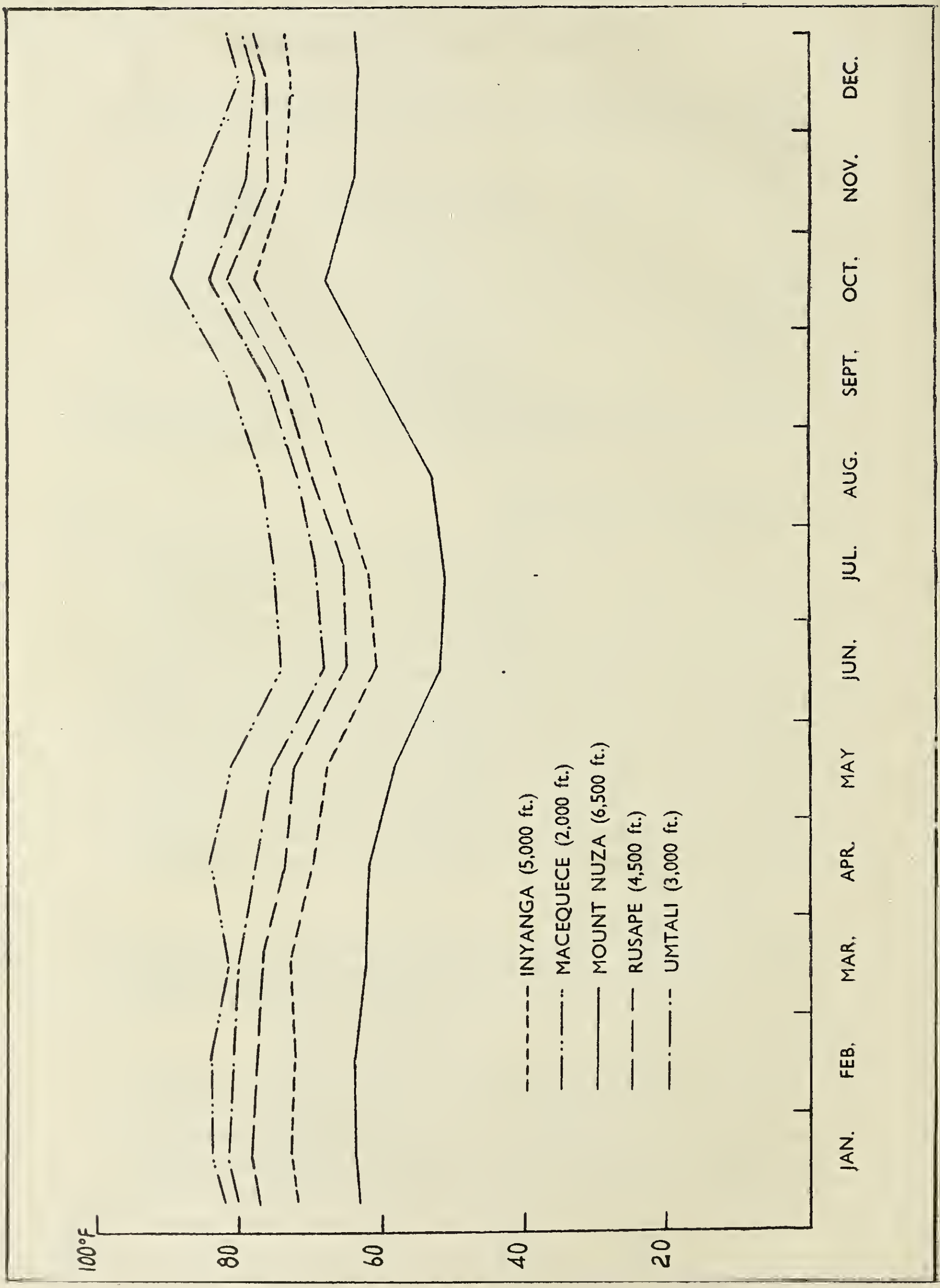


Fig. 3.—Graph showing the variation of mean maximum temperature with locality and season in Manicaland.

etc. *Cynodon* and other creeping grasses are absent so that much bare ground is visible.

The Tall grass stage.—The above is succeeded by a series of tall grass communities (Plate 12.*a*) with their associated plants. *Hyparrhenia gazensis, H. hirta, Setaria* and *Pennisetum* are prominent.

The first tree stage.—The period occupied by the preceding stages is short and they are followed quickly by the invasion of the

(*a*) **muJanje—muTongoro stage.**—This stage is very common on the valley plains and is particularly connected with native cultivation. It consists sometimes of almost pure stands of *Uapaca Kirkiana* (muJanje ; Plate 12.*b*.) but more often of a mixture of *U. Kirkiana* (Plate I3.*a*.) and *U. nitida* (muTongoro; Plate 13.*b*.) These trees are fairly short, rarely exceeding 35 ft. in height, with a straight trunk, branching above in the manner of an umbrella, to form a flattish crown, the leaves being bunched at the ends of the branches. The bark and foliage are fire-resistant to a high degree. (Specimens felled and burnt over quite commonly coppice.) The trees bear edible fruit which is much fancied by Man and Baboon alike, with the result that the seed is widely distributed. (Mutc evidence of this last is to be found in the association of the muJanje with native paths in both the muTsatsa and muPfuti zones.)

The tree very quickly invades the grass stage (Plate 14.*b*.)—or recuperates by coppicing from the rigours of fire and axe (Plate 14.*a*)—and is very fast growing, soon forming dense stands with a poor associated grass and shrub flora. The native practice, sufficient of these having now become established through long habitation of the valleys, is now to fell and burn muJanje for new lands in preference apparently to any other stage. From this it follows, and is borne out in practice, that invasion of muJanje is rare and difficult to find—a sort of rotation being established.

The associated plants of this community are:—*Indigofera spp., Borreria dibrachiata, Psychotria, Widelia abyssinica, W. natalensis, W. nemotricha, Vernonia leptolepis, Lightfootia abyssinica, Antidesma venosum, Phyllanthus petandrus, P. glaucophyllus, Scirpus, Scleria Buchanani, Mariscus sieberianus, Brachiaria brizantha, Digitaria, Sporobolus, Themeda triandra* (rare) and *Trichopteryx.* Of these the last-named is present in greatest quantity.

(*b*) **The muOnga stage.**—With a poorer grass flora, though much richer shrub flora, is the muOnga stage. (muOnga = thorny plant,

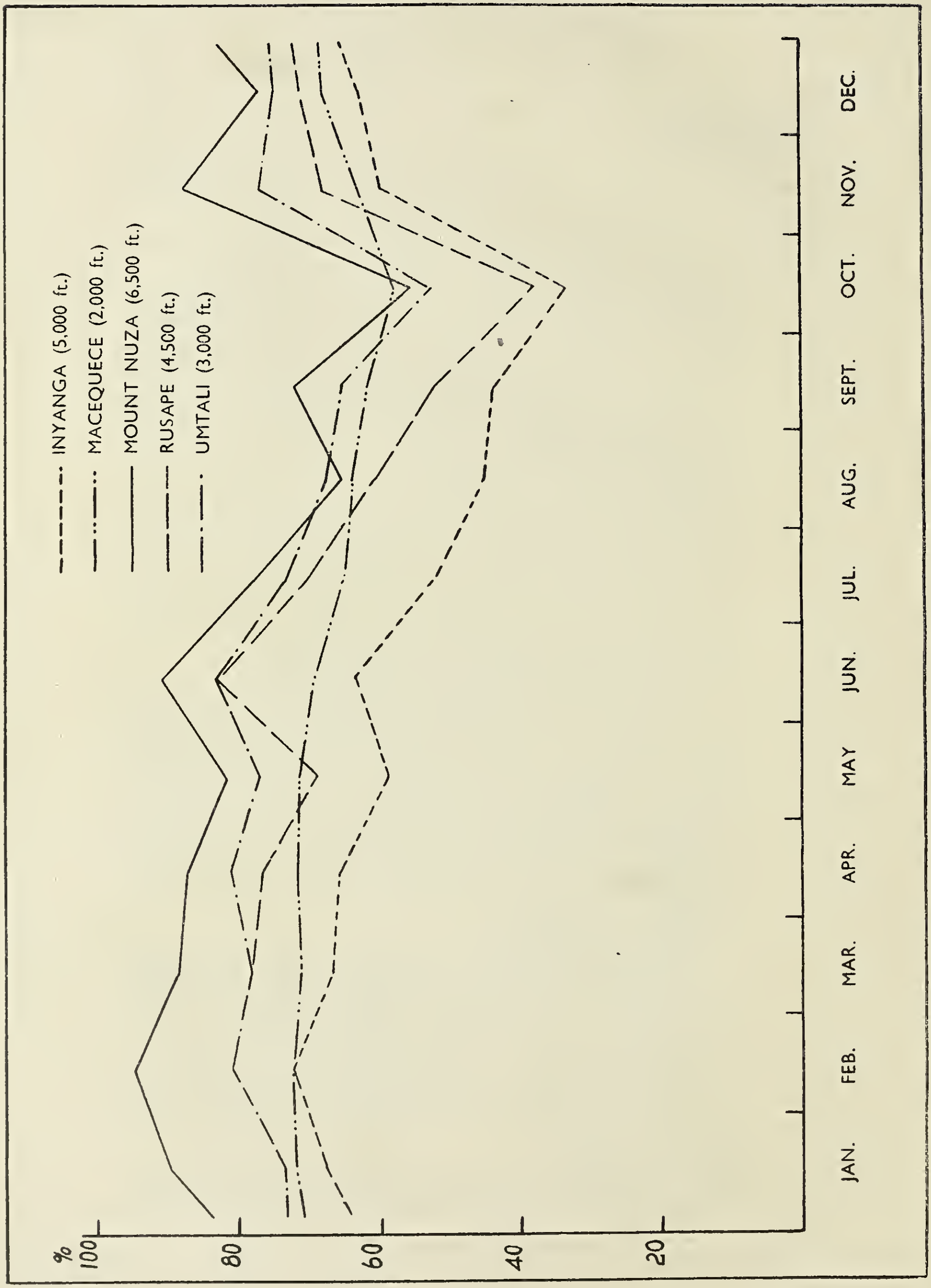


Fig. 4.—Graph showing the variation of mean minimum temperature with locality and season in Manicaland.

e.g. *Acacia spp.* and *Dichrostachys glomerata.*) The origin of this community is not clear, though obviously depending more than the above on the proximity of a seed source, since the fruits are chiefly pods, not berries. The community is predominately one of small trees and large shrubs (10-20 ft. high, e.g. above and *Randia vestita*). The natives do not, as a rule, cut and burn this, probably on account of the abundant thorn. Several tall invaders were noted, particularly the muGaranyense (*Burkea africana*).

The Tall tree stage.—The period occupied by the preceding stages is probably not very long, say 50—100 years. They are succeeded by a tall tree stage of which two types were noted :—

(*a*) **The muChakati.**—The muChakati (*Parinarium*) (Plate 15. *b*) dominates over small areas and occasional very large specimens up to 60—80 ft. are to be noted in muJanje communities. The tree reaches a height of 100 ft. and has a large round crown of leaves. The fruit is eaten by the natives and baboons. This community was probably among the first selected by the natives to cut, burn and cultivate. muChakati in process of invading an earlier stage is difficult to find and was not observed by the writer.

(*b*) **Later stages.**—In favoured sites, sheltered by natural topography or for other reasons free from fire, fairly old specimens of *Afzelia* and *Pterocarpus* (chiCundambira), together with the muGaranyense and a rich undergrowth of shrub and forest grass occur.

The Hydrosere.

General.—The usual aquatic plant-sedge-rank grass stages are to be observed (e.g., *Podostoms* (Plate 15. *a*), *Hydrostachys-Cyperus-Setaria, Pennisetum* and *Hyparrhenia*). The dominant trees are *Adina microcephala, Pterocarpus* and *Afzelia* on the deeper, more mature soils. The muPfuti is present here on rocky sites.

Secondary stages.—Most native cultivation, other than of mealies, sorghum and sesamum, is on vlei or semi-vlei soil (e.g., Rhapoco, Rice, Pumpkin, Gourds and Sweet potatoes). Here the pioneer community is one of *Polygala, Corchorus, Cissus, Amarantus chlorostachys, Celosia trigyna, Cyperus, Fuirena, Pycreus angulatus, P. macranthus, Setaria aurea*, etc. This is followed by a rank grass community (Plate 16. *a*) commonly completely dominated by *Hyparrhenia cymbaria. Imperata cylindrica* occasionally forms an outer zone when burning is the only disturbing agent.

Rainy season facies.—A " rainy season " facies common to all stages of secondary succession prior to the rank grass stage consists of annuals and ephemerals such as *Commelina, Lobelia, Oxalis* and *Biophytum.*

The xerosere.

(*a*) **Pioneer stages.**—The usual lichen-pioneer-grass-succulent community (Plate 16. *a*, foreground) is here, containing *Stapelia variegata, Ilysanthes, Torenia spicata, Aeolanthus* and numerous Orchids. The unusually large number of the latter associated with the lithosere in both the Honde and Numkwarara valleys is noteworthy. A large community of epiphytes, mainly Orchids, should probably be also included here, though it forms an integral structural part of the tree stages.

(*b*) **The muPfuti stage.**—This stage is confined to rocky and immature soils (Plate 16. *a*, background). It is to be placed here in the final stages of the xerosere before the transition to the climax vegetation. Two trees are noticeable, the one the muPfuti proper of Manicaland, *Brachystegia flagristipulata* (Plate 17. *a*), on the wetter and warmer sites, and the Narwatsi, which is *Brachystegia utilis* (Plate 17. *b*) on the drier and cooler spots. As the raw rocky soils are by far the commoner in this zone the trees are numerically preponderant. The muTsatsa invades down into this zone along the streambanks, the abundant and easily available water probably compensating for the greater heat. Where soils have become more mature the later stages of the mesosere invade. Except for the greater preponderance of shrubs and perennials the accompanying vegetation differs little from the muJanje-muTongoro community till the muPfuti itself is being invaded.

(C) The muTsatsa Zone. (*Brachystegia spp. of B. Randii type.*) This zone lies roughly between 3,500 ft. and 5,000 ft. The lower limit is fairly well defined to the east of the escarpment, but the upper limit and the limits to the west of the escarpment are very difficult to determine with similar accuracy (Weimarck, 1932). The zone is by far the largest in area in Manicaland and, just as with the muPfuti is divided by the escarpment into western and eastern sections :

(1) **West of the escarpment.**—This portion is bounded by the Rusape—Inyanga and the Rusape—Umtali roads, having the before-mentioned outlier of muPfuti pushing in near Odzi from the south along the Tsungwesi river bed. Its eastern boundary is difficult to define and may be taken in general as the line of *Acacia rehmanniana*, which forms a narrow belt irregularly from Inyanga to Umtali along the west of the escarpment. There are three meteorological stations within this zone of which records are available ; Inyanga at the upper limit of

the zone ; Rusape at an average altitude and Umtali at the lower limit. The Umtali station occurs where the escarpment is not sufficiently high to produce a division of the muTsatsa zone into two by the interpolation of a mountain zone.

(2) **East of the escarpment.**—This is much more clearly marked, extending from the muPfuti zone below to about 5,000 ft., where the muTsatsa and the muJanje become dwarfed and very rarely manage to fruit (Plate 18. *a*). Here there is no meteorological station and none exists in a properly comparable site.

Biotic factors.—Man.—Apart from European farmers, mainly centered round the roads, the human population is chiefly centered round the kraal of the chief Umtasa and elsewhere in native reserves. Both make use of fire for " early grazing " and there is much evidence of severe overstocking and veld deterioration in this zone particularly between the Honde and Inyanga. Evidence of a fairly extensive human occupation in prehistoric times is to be found in the van Niekerk ruins at Inyanga. This may be the same culture responsible for the terraces and " slave pits " of the mountain zone and at any rate the result and effect of their occupation has been the same in both cases ; namely deforestation.

Succession and chief communities.—The writer did not make a very detailed examination of this zone. As in the case of the muPfuti, much further work is still required. The majority of the observations here made refer to the valleys of the Odzani, Honde and Numkwarara Rivers and to the Penhalonga Valley.

The climax.—The climax of this zone is subtropical evergreen high forest. While the rainfall to the east of the escarpment can safely be put at 40 ins. and over, at Rusape in the west it only exceeds 30 ins., in very favourable seasons. And, even if the ameliorating effect of a high forest vegetation on the escarpment and to the east of Rusape be admitted, insufficient data are anywhere available as to the possible extent of that amelioration. Consequently, while from field observations it appears that the climax of this zone round the escarpment is high forest of the subtropical type, such as exists at the Nyumterese Falls, Garuso in Portugese East Africa and Mt. Selinda (Plate 18. *b*) in Gazaland, it is as yet uncertain how far this forest could extend to the west ; whether, indeed, in terms of the climax at any rate, the muTsatsa zone is not really an unnatural one based on the present existence of a sub-climax vegetation with a very much wider range of tolerance than the climax stage. A community was noted in a kloof caused by erosion (Plate 19. *a*), ten miles west of the escarpment in typical muTsatsa, composed of shrubs typical of the ecotone of this high forest and, from the general presence of the indicator shrub *Hypercium quartinianum* it can be safely asserted that the climax zone is at least some miles from the escarpment to the west.

The forest shows a well-marked structure of the usual type :—

(*a*) The dominant trees, with Lianes, canopy at an average height of 120-200 ft. (Plate 19. *b*), *Khaya nyassica* (Plate 20. *a*), *Schefflerodendron gazense*, *Lovoa Swynnertoni*, *Trichilia chirindensis*, and a parasitic fig (Plate 20. *b*), here and there are the chief constituent species.

(*b*) A second shrub storey of shade enduring shrubs. Many members of the Rubiaceae, e.g., *Tarenna*, *Grumilea*, *Empogona* and *Tricalysia*, are the chief members.

(*c*) The forest carpet, consisting chiefly of mosses and ferns with annual and perennial shade enduring herbs.

(*d*) A forest edge community with trees of different species and somewhat smaller stature such as *Gardenia*, *Croton*, *Polyscias* and even *Brachystegias*. A characteristic shrub and forb flora is also present in this edge community.

Insufficient data are available to note the lociation and faciation of this forest type.

Seral communities.

Secondary succession.—Secondary succession occurs, generally speaking, on the flatter portions, which have presented now and in the past an easier task to the cultivating native. Two distinct types are noticeable according to the type of rock from which the soil is derived, namely from granites or from schists. These two types, however, only become really distinct in the first tree stages preceding climax development.

The pioneer community.—The plants growing on denuded sites in this zone were not well noted. The following were seen, however. *Oldenlandia herbacea*, *Walafrida tenuifolia*, *Thunbergia lancifolia*, *Eragrostis*, *Pogonarthria* and *Cynodon dactylon*.

The early plants of the disturbed veld.—Where the veld has been distrubed a very characteristic flora of geophytes appears, whether the disturbance is due to firing or overgrazing or both. Among these the following are noteworthy. *Sida*, *Hermannia compressa*, *Triumfetta*, *Eriosema*, *Rhynchosia minima*, *Veronia Kraussii*, *Wahlenbergia denudata*, *Margaretta Whytei*, *Trichodesma physaloides*, *Astrochlaena malvacea* (Plate 21. *a*), *Ipomaea*, *Solanum panduraeforme*, and *Becium*.

The tall grass community.

(*a*) Undisturbed sites. The tall grass community on undisturbed sites contains *Trichopteryx*, *Tristachya* and *Panicum*, *Diplachne biflora*, etc., strongly reminiscent of the high-veld of the Transvaal (Plate 21. *b*, Glover, 1937 ; Weimarck, 1932).

(*b*) Disturbed sites. Disturbed sites are dominated by *Hyparrhenia hirta; Eragrostis*, *Pogonarthria* and *Hyparrhenia gazense* accompany it. A further prominent community here is one dominated by *Helichrysum Kraussii* (Plate 22. *b*).

(*c*) The accompanying forbs in both are chiefly those mentioned under par. ii, while the following shrubs invade : *Gymnosporia*, *Cissus*, *Rhus dentata*, *Clerodendron*, *Lippia salvifolia*, *Asparagus*, etc.

The first tree stage.

(*a*) **The muTsatsa community.**—The muTsatsa (*Brachystegia Randii*, Plate 23. *a*), is the dominant tree of this community. Here again, as with the muPfuti, the tree is a fire-resistant xerosere tree, invading following fire. Owing to this last it occupies a very much larger area within its proper zone than the muPfuti in Manicaland. The muTsatsa is commonly accompanied by the muTondo (*Berlinia globiflora*) together with *Hypericum quartinianum*, *Psorosperum febrifugum*, *Grewia occidentalis*, *Ochna*, *Dodonaea viscosa*, *Bersama*, *Lannea Schimperi*, *Tephrosia nyassae*, *Combretum holosericeum*, *Cussonia Kirkii*, *Pavetta rhodesiaca*, *Vangueria*, *Gardenia*, *Chrysophyllum argyrophyllum*, *Euclea divinorum*, *Carissa edulis*, *Solanum chrysotrichum*, *Vitex Hildebrandtii*, *Faurea speciosa*, *Ximenia americana*, *Phyllanthus discoideus*, and numerous forbs, sedges and grasses.

Pterocarpus Bussei was observed invading this community.

(*b*) **The muJanje.**—The muJanje (*Uapaca Kirkiana*) is here again present marking the disturbed site and seral to muTsatsa. The muTongoro has not been observed west of the escarpment. The muJanje is slower growing and smaller in this zone than in muPfuti.

(*c*) **The muOnga community I.**—The muOnga (see also under muPfuti) community (Plate 23. *b*), occupies schistose and alluvial soils and is, of course, particularly prominent round Penhalonga. Common shrubs accompanying this community are : *Anona senegalensis*, *Dichrostachys glomerata*, *Elephantorrhiza suffruticosa*, *Bauhinia fossoglensis*, *B. Petersi*, *Combretum apiculatum*, *C. erythrophyllum*, *C. Guenzii*, *Royena pallens*, *Gardenia asperula*, *Carissa edulis var. tomentosa*, *Cryptolepis oblongifolia*, *Phyllanthus guinensis*, and numerous forbs and grasses. *Dalbergia melanoxylon* was observed invaing this community.

(*d*) **The muOnga II.**—This muOnga (*Acacia Rehmanniana*, Plate 24. *a*), forms a community with a peculiar distribution being found at the zone of interaction between the muTsatsa and the mountain zones. Notable groups are to be found at Nodzi and on the road between Inyanga and Rusape. This community is mainly confined to rocky koppies and slopes. The accompanying shrub and forb flora is the same as in muTsatsa.

The Xerosere.—The Xerosere is a prominent feature of this zone (Plate 24. *b*), which is rich in residual soils and rocky slopes and boulders. The muTsatsa, accompanied by *Ficus* on the more inaccessible spots, is manifestly the final community of this sere, below the climax invasions. The physiognomic differences between the schist and granite sites in this sere need further investigation. The following were noted as prominent in this sere : *Cheilanthes hirta, Pellaea calomelanos, Cleome monophylla, Crassula Clunliffii, Borreria dibrachiata, Oldenlandia herbacea, Vangueria, Vernonia Steetziana, Wahlenbergia, Philippia, Myrsine africana, Barleria, Pouzolzia hypoleuca, Aloe, Asparagus, Bulbostylis, Aristida, Hyparrhenia.*

The Hydrosere.—The usual stages are here observable, culminating in the *Syzygium* community (*S. cordatum* and *S. guineense*). In the climax community *Adina microcephala* would characterise this locies just as in the muPfuti zone. The following shrubs and herbs were noted as characteristic of this sere : Shrubs : *Sesbania, Mikania natalensis, Rhamnus prinoides, Trema guineense, Rubus, Jasminum, Salix safsaf, Phoenix reclinata, Cleistachne sorghoides, Hyparrhenia cymbaria, Miscanthidium teretifolium, Panicum maximum, Pennisetum,* etc. Herbs : *Nasturtium officinale, Polygala, Hypericum Lalandii, Alchemilla, Apium leptophyllum, Helichrysum fulgidum, Samolus Valerandi, Limosella aquatica, Utricularia, Crinum regale, Commelina, Ascolepis capensis, Andropogon eucomus, A. laxatus, Brachiaria, Sacciolepis.*

(D) **The mountain zone.**—This zone includes all land above 5,000 ft., and in this zone are the peaks of S. Rhodesia, Mt. Inyangani, 9,000 ft., and Mt. Nuza, 6,666 ft., separated by the Honde and Pungwe gorges. There is a plateau area associated with each ; the Inyanga Downs in the north of the gorges and the Mt. Nuza plateau to the south. The climate on the whole is that of mountain forest, perhaps best defined as those parts subject to " vumbi " or mist equivalent to the mist belt of the Union (Bews, 1920). The area grades off into muTsatsa to the north and east while still fairly high, i.e., in excess of 5,000 ft. There are two meteorological stations in the zone; (*a*) At Mt. Nuza ; and (*b*) At Stapleford (5,200 ft.). The readings for the Stapleford station have long been considered atypical by the Meteorological Office in Salisbury, and indeed the station is situated in a frost hollow on the banks of the Odanzi on the south-west face of Mt. Nuza. They are, however, useful indications of the degree of variation within the mountain zone.

Biotic factors.—Man.—Evidences of a prehistoric culture in this region are many and impressive, consisting of so-called slave pits (Plate 25) with their adjoining terraces and aqueducts. Mason, (1933), has examined this culture and has identified the pottery remains with those of the van Niekerk ruins in the muTsatsa zone at Inyanga. Many of the slave pits have been invaded by trees, but as yet investigations on the tree rings with a view to determining the age of the invading vegetation have not yet been attempted. To Mason's statement : " for many of the plants connected with these ruins are not indigenous " exception is taken. Such is not the case.

Present-day man, in the shape of the Manyika tribe, carry on here mainly a pastoral agriculture ; their crop culture being limited to vleis and special small sites (Plate 26. *a*). A much higher standard of building and cleanliness in this climatic zone compared with the previous two is noteworthy.

Animals.—Animals play as important a part in the development of the vegetation here as elsewhere. An instance will be cited in discussing the secondary succession. **Locusts** in periodic swarms are frequent and do much damage to the vegetation by defoliation. Here, however, as elsewhere, our knowledge of the animal ecology is sadly deficient.

The climax.—The climax of this zone is evergreen mountain forest with a considerable faciation and lociation as follows. (Note: faciation = community induced by a micro-differentiation within the climate ; lociation = community induced by an edaphic difference.)

(*a*) **Hydroseral climax lociation.**—The maPande (*Widdringtonia Whytei*) (Plate 26. *b*), together with *Podocarpus milanjianus* may form the ultimate vegetation here. They exist at present only as relict groups of small number, particularly with a cool south and south-east aspect. (This may be a climatic relict in the sense of Clements, 1934.) *Curtisia faginea, Ilex mitis, Macaranga mellifera, Syzygium cordatum, Aphloia myrtiflora* and *Cussonia umbellifera* form this community (Plate 27. *a*), the last, perhaps, because of its greater potential height, being the most important in the warmer sites. Shrubby and herbaceous plants of this lociation are : *Marattia fraxinea, Cyathea Deckenii, Impatiens sylvicola, Hydrocolyle Mannii, Galopina circeaeoides, Lobelia Stricklandae* (Plate 27. *b*), *Plectranthus, Strelitzia, Cyperus, Ehrharta erecta, Oplismenus africanus* and *Melinis*.

(*b*) **The xeroseral climax lociation.**—The xerosere is ultimately occupied by a *Philippia-Protea* scrub with occasional invasions on pockets of deep soil of *Rapanea melanophleos*. The summit of Mt. Inyangani is a good example (Plate 28. *a*). The constituents are : *Philippia benguellensis, Protea melliodora, Protea sp., Erica Johnstoniana, Myrsine africana* and *Aloe arborescens* ; accompanied by *Anemone peneensis*, (Plate 28. *b*), *Lotononis humifusa, Crassula arborella, C. abyssinica, C. nodulosa, Drosera, Alepidea propinqua, Erica, Hebenstreitia dentata,* *Eragrostis grandis, Festuca costata, Koeleria, Monocymbium, Pentaschistis' Trichopteryx, Tristachya hispida* and *Trachypogon plumosus.*

(*c*) **The climax proper.**—On the hot northern and north western aspects the muJerenje is dominant (*Albizzia fastigiata*) with more and more of the m'Tengembia (*Polyscias*) (Plate 29. *b*). This latter tree seems to be invading from the north and bids fair to overtop the muJerenje than which it is a quicker growing taller tree. Ficus with the parasitic habit is frequent here on muJerenje and others. The forest shows the normal terracing, having a canopy (Plate 29. *a*), shrub storey and forest carpet. A good example is the forest of Ziwani on the Imbesa Forest estate. The shrub storey contains: *Grumilea, Psychotria, Pavetta, Tarenna, Piper capense, Fleuria, Peristrophe,* etc. The lianes of the canopy and forest edge are: *Mikania natalensis, Senecio, Solanum, Ipomaea involucrata, Aristolochia, Thunbergia alata, Momordica Mokorra, Rumex sagittatus.* In the forest carpet community (Plate 30. *a*), the following were noted: (This also includes a large number of epiphytes which are, logically, to be included in this community in this zone, the frequent mists rendering them scarcely to be considered xerophytic, marked *) *Aerobryum capense*, Mastigobryum adnexum*, Pilotrichella chrysoneura*, Plagiochila crispulo-caudata*, Porothamnium natalense*, Asplenium hypomelas*, A. linearilobum*, A. Mannii*, A. pergracile, A. Saundersonii*, Blechnum capense*, B. tabulare, Dryopteris africana, Elaphoglossum Aubertinii*, E. isabelense*, Hymenophyllum Kuhnii*, Loxogramme lanceolata*, Lycopodium verticillatum*, L. ophioglossoides*, Selaginella abyssinica, S. Kraussiana, Vittaria*, Thalictrum rhynchocarpum, Streptocarpus*, Peperomia reflexa*, Viola abyssinica, Adenostemma Dregei, Plectranthus laxiflorus, Tritonia laxifolia,* and the grasses noted under *a.*) The forest edge species, being of importance in the seral progress, are discussed later.

Primary succession.—Primary succession is now only observable in the hydroseral and xeroseral communities in any long series of stages. Elsewhere it only appears in the reproductive phases in the climax.

Secondary succession.—Secondary succession stages occupy a very large area since the region has undoubtedly been subject to the rule of axe and fire and other instruments of primitive agriculture, together destroying the pre-existing climax.

(*a*) **Stages noted resulting from disturbance** (e.g., ploughing, hoeing, overgrazing).

The pre-Cynodon stage.—This stage normally is of short duration, being composed of annuals and ephemerals, giving place in the course of a single season to the next stage. Here, however, especially on sites which are all too common, exposing rotting rock in lieu of soil, may persist for many years. Commonly growing here were : *Erigeron canadense, Lobelia rosulata, Panicum laevifolium, Eragrostis, Sporobolus*, etc.

The Cynodon stage.—This stage is here remarkable for the small amount of Cynodon present, and is indeed chiefly named such in conformity with experience elsewhere (Glover, 1937). *Eragrostis* and *Panicum* are the dominants accompanied by geophytes noted below.

The tall grass stage.—This stage intervenes between the Cynodon stage and the first shrub stage where acceleration influences are at work. Otherwise the *Cynodon* stage merges into the *Trichopteryx* community noted below. It consists of *Hyparrhenia* and *Cymbopogon*, together with several tall perennial forbs, e.g., *Helichrysum spp.*

The shrub-tree forest stages follow as described below.

(*b*) **Stages observable through the persistent use of fire.**

The Trichopteryx community.—Following the use of axe and fire the mountain forest gives way to a community composed of *Trichopteryx* and its associates. The extent of this area is well shown on Henkel's map and its overlap with the muTsatsa is already noted. This overlap is probably due to tree felling for agricultural and hut-building purposes, coupled with the greater range of environmental tolerance of the *Trichopteryx* community. The grasses of this community are : *Alloteropsis semialata, Andropogon schirensis, Brachiaria serrata, Chloridion Cameronii Digitaria, Eragrostis, Hyparrhenia, Monocymbium, Panicum natalense, P. spp. Rhynchelytrum setifolium, R. roseum, Themeda triandra, Trachypogon plumosus* and *Trichopteryx simplex* (cf. Glover, 1937).

Associated geophytes and perennial plants.—There are also often found with the previous three grass stages the following geophytes and perennial plants. *Pelargonium aconitophyllum, Hypericum peplidifolium, Oxalis semiloba, Dolichos Buchanani* (Plate 30. *b*), *Eriosema Burkei, E. cordatum, E. montana, Indigofera Rehmanni, Lotononis Eylesii, L. corymbosa, Rhynchosia monophylla var. Eylesii, R. totta, Vigna, Peucedanum Clausenii, Pentanisia variabilis, Oldenlandia, Helichrysum adenocarpum, H. nudifolium, Senecio bupleuroides, Vernonia Bainesii, V. monocephala* (Plate 31. *a*), *Wahlenbergia denudata Asclepias, Schizoglossum, Xysmalobium, Ipomaea crassipes, Cycnium adonense, Harveya Randii, Justicia, Becium obovatum, Leucas milanjiana, Cluytia monticola, Euphorbia cyparissoides, Euphorbia depauperata,* many *Orchids, Gladiolus, Morea, Hypoxis filiformis, H. villosa, Bulbine, Chlorophytum, Dipcadi, Drimia pallens, Ornithogalum, Scilla transvaalensis, S. ovatifolia, Tulbaghia, Albuca, Cyanotis nodiflora*, etc.

Seral stages to the mountain forest climax.

Hydroseral.—Two main stages are noticeable, clear cut in their extremes but of course merging in intermediate places.

(*a*) **Quick running mountain streams.**—These from their very nature are protected from fire, having steep sides, and the rate of succession is fast. Sedges are relatively uncommon and the riverine grasses form the first stages. The first community consists of: *Crassula alsinoides, Juncus, Digitaria, Haemarthria altissima, Leersia hexandra* and *Setaria orthostica.* The riverine grass community becomes taller through the invasion of further species and certain shrubby composites namely: *Helichrysum odoratissimum* and *H. umbraculigerum*, which give character to this community. Prominent grasses are: *Digitaria, Ischaemum arcuatum, Imperata cylindrica, Eulalia villosa, Schizachyrium brevifolium* and *Setaria splendida.* This stage culminates in the entry of *Cyathea Dregei.* Further shrubs very soon invade this stage, the most prominent being: *Hypericum leucoptychodes, Rubus* and *Maesa lanceolata.* Other shrubs noted here were: *Clematopsis, Polygala speciosa, Pavonia Meyeri, Rhamnus prinoides, Rhoicissus cuneifolius, Psoralea foliosa, Smithia thymodora, Cliffortia sp., Choristylis shirensis, Dissotis princeps, Heteromorpha arborescens, Anthosperum, Philippia benguellensis, Buddleia salvifolia, Lycium, Sutera grandiflora, Clerodendron sansibarense, Lippia asperifolia, Moschosma riparia, Leonotis, Pycnostachys, Cluytia, Aloe* and *Smilax kraussiana.* Subsequent to the invasion of these shrubs the following trees appear and the vegetation gradually develops into the hydroseral lociation of the climax. *Aphloia myrtiflora, Pittosporum, Toddalia aculeata, Ilex mitis, Syzygium cordatum, Cussonia umbellifera, C. spicata, Curtisia faginea, Rapanea melanophleos, Carissa arduina, Lachnopylis sambesina, Halleria lucida, Macaranga mellifera* and *Myrica pilulifera.*

(*b*) **The vlei and streambeds of low gradient** (Plate 31. *b*).—Here natural topographical fire-protection is absent, frost is common (most of the vleis are natural frost-hollows) and the succession is thus held in check. Stages beyond the meadow stage are uncommon. Sedges are prominent together with riverine grasses of relatively short stature in at least two well-marked zones.

Inner zone.—The inner zone is dominated usually by *Scirpus macer* and contains *Potomageton nodosus, Brachiaria, Haemarthria altissima, Stiburus alopecuroides, Utricularias* and many *Orchids.*

Outer zone.—The outer zone is more of a mixture and often contains small socies of inner zone species in process of displacement. Prominent here are *Cyperus, Juncus, Andropogon eucomis, A. huillensis, Arundinella Ecklonii, Eriochrysis pallida, Imperata cylindrica, Ischaemum arcuatum,* *Schizachyrium brevifolium*, *Setaria splendida*, *Sporobolus*, with socies of *Eragrostis grandis* and *Phragmites vulgaris* round the edge. On the banks of running water through these vleis is a very characteristic community of Ainya (*Cliffortia*) and *Leucosidea sericea* in separate socies.

Forbs.—Common forbs associated with all these communities, though most frequent in the outer zone, are : *Lycopodium sarcocaulon*, *Polygala*, *Geranium incanum*, *Impatiens trichochila*, *Argyrolobium*, *Agrimonia eupatorium*, *Alchemilla inyangensis*, *Drosera madagascariensis*, *Epilobium nereiphyllum*, *Hydrocotyle sibthorpiodes*, *Cephalaria*, *Scabiosa*, *Denekia capensis*, *Gerbera*, *Widelia abyssinica*, *Xysmalobium*, *Chironia Krebsii*, *Swertia stellarioides*, *Sopubia*, *Striga elegans*, *Gladiolus* and *Zantedeschia aethiopica*.

Cyathea Dregei invades the outer edge of the vlei and is accompanied by *Hypericum leucoptychodes* and *Rubus* and eventually, though much more slowly, the climax lociation is established (Plate 32. *a*).

Xeroseral.—This sere is well defined here and has, particularly round the summit of Mt. Inyangani, been held in check as much by the absence of forest in its immediate vicinity to provide disseminules as by any active agent. Succulents are common here in the early stages, e.g., *Crassula* and *Aeolanthus*, and these are followed by the Trichopteryx grassland in modified form. *Protea-Philippia* scrub forms the climax lociation as already noted.

Secondary succession.—The balance of the evidence available, in the opinion of the writer, indicates that a pre-existing forest climax has here been destroyed and the resultant sub-climax grassland held in check by the annual use of fire.

This statement receives considerable support from the stages observed at Stapleford Forest Reserve since that area was declared a reserve and carefully protected from fire (see similar observations by Henkel, 1916, on the Drakensberg). These stages are particularly noticeable on the northern patrol and were carefully noted by the writer. This plateau consists mainly of the plateau associated with Mt. Nuza and stretching north from it for a distance of two to three miles to the Honde escarpment. It forms part of the *Trichopteryx* grassland (cf. Plate 32. *b*), except that subsequent to the fire protection a large number of clumps of woody vegetation have developed. These clumps are termed " churu " by the natives (Plate 33. *a*). From an analysis of these churu and from the fact that the larger ones are to be found next to the eastern escarpment, the smaller ones distant from it, it is clear that they represent invasions of the grassland by woody types of vegetation. The stages of the re-invasion may be summed up as follows :—

(1) *Hypericum leucoptychodes* (Plate 33. *b*).—*Bramble* community.

(2) A community dominated by *Maesa* and *Rapanea* (Plate 34. *a*) with the preceding forming an edge community or ecotone.

(3) A short forest community with stages 2 and 1 round the edge in that order.

The coaction of animals in this process is fairly clear. The sites of these churu are almost invariably areas previously disturbed by animals of some sort. And on establishment they become the headquarters of rodent communities and wild pig. Duiker too use them as "homes" particularly during the heat of the day. The probable sequence of events in most cases is as follows :—

(1) The establishment of a termitary in pre-protection days in the grasslands.

(2) An attack on the termitary by an ant-bear. Before or after fire-protection.

(3) The invasion of the ant-bear hole by a tall growing, shade producing herb or fern (e.g., *Mohria caffrorum*). (See also Bews, 1913.)

(4) The invasion of this tiny community by a seedling *Bramble* or *Hypericum* giving rise soon to the early stages noted.

The first forest stage which follows the increase in size of the churu is perhaps best exemplified by the forest of chiNyamariro (Plates 34. *b* 35). *Syzygium* (the muOtoto) and *Conopharyngia* (the muChechene) are the dominants while a *Podocarpus milanjianus* some thirty feet in height is present.

Other evidence.—Mr. E. E. Phaup has drawn attention to the following peculiar feature of the Odanzi Valley. The river rises on the south-west face of Mt. Nuza, and flows west through a twisting, flattish streambed till reaching the muTsatsa zone, when the character of the stream alters entirely. It now becomes a steep-sided stream, which, in the rains, is a rushing torrent. This feature is common to all the west flowing streams in the mountain zone. Together with the existence of relics of a forest vegetation all along the immediate eastern face of the escarpment, in kloofs and on small plateau, and the evidence as to the speedy invasion of the grassland by forest vegetation following fire protection, this leads to the conclusion that a forest vegetation existed here prior to the development of fire and axe as potent factors of the environment. In fact this is not a mountain grassland, but a mountain forest zone.

Conclusions.

(1) Stone-age man probably had little effect on the vegetation of Manicaland, since though probably acquainted with the use of fire, he was not a hut-building, cattle-owning type and probably ate his food raw.

(2) Iron-age man, probably Bantu, owning and grazing cattle, building dwellings and cooking food, and using axe and fire to further these occupations as well as hoe to cultivate crops, has been in occupation of Manicaland probably not less than one thousand years.

(3) The present vegetation of all three zones noted by Henkel, most likely as a result of (2), is characterised by sub-climax vegetation of muPfuti (*Brachystegia*), muTsatsa (*Brachystegia*) and mountain grassland (*Trichopteryx* community).

(4) Relics of an evergreen forest climax of three main types are to be found in each however :—

(*a*) **In muPfuti,** in the riverine vegetation particularly of the Honde-Pungwe confluence (seen), and probably also the forest of the Amatongas in Portuguese East Africa. Tropical evergreen forest.

(*b*) **In muTsatsa,** in the forests of the Numterese Falls in the Honde Valley, of Mt. Selinda in Gazaland, and of Garuso in Portuguese Manicaland. Sub-tropical evergreen forest.

(*c*) **In the mountain zone,** in the forests of the kloofs and eastern sides of the mountain range such as at Ziwani and chiNyamariro. Temperate evergreen forest.

(5) While the above conclusions hold for most of the actual eastern escarpment with its high rainfall, some considerable dubiety exists concerning the western extension of the area round Rusape. Here the rainfall falls off and experiment with exclosures is prerequisite to the final answer.

Discussion.

The concept of the climax arose tentatively many years ago (Clements, 1904), but was first clearly enunciated in 1916 (Clements, 1916). Since then the concept has developed and certain difficulties have arisen, Phillips (1934-35), has cleared the air and defined the position of the " monoclimax " school, others (see Phillips, l.c. refs.) have proposed a " polyclimax " view, while Braun (1935) has endeavoured to reconcile the two with her term association-segregate.

The differences seem to have arisen from the fact that the climaxes described initially in North America exhibit a considerable species-uniformity, which has thereafter been inherently implied in the writings of many authors. But, that that is not the case, is apparent not only from the later writings of Clements and from Phillips (1931), but also from phenomena noted by Allee (1931) in Panama and commented upon by Adamson (1931) for Table Mountain. The latter re-emphasised the concept of " life-form dominance " rather than species dominance as a guide to the recognition of a climax. In other words the emphasis is thrown not on the qualitative composition but on the structure of vegetation.

Further differences have arisen from the fact that different species groups may hold different soil types within one climax, and, the emphasis being inherently laid on species-uniformity, these have been called "edaphic climaxes."

That any of these differences are greater than the difference normally to be noted in the hydroseral lociation of a climax would be an overstatement and yet to term such a separate "climax" is manifestly inadvisable. Further, a moment's reflection will show that, at any rate in cases such as that of the mountain zone reported here, such a hydroseral lociation is inherent in the drainage system of an escarpment which itself causes the climate. In other words when ultimately the escarpment be eroded flat enough to render the hydroseral lociation unimportant, the height of the whole escarpment itself will be so changed as to radically alter the climate.

Hence it is concluded that a species diversity is inherent in a climax and that cases of species-uniformity are to be interpreted as special cases. That, in fact, a concept of the climax embracing species-diversity due to edaphic causes (lociation) is as just as one which embraces species-diversity due to micro-climatic differences (aspection, faciation).

This is the concept of the climax used in this paper.

Clements' latest ideas (1934-36) view climaxes themselves in relation to a climatic category bearing the same relation to the climax climate as genus does to species. This is the panclimax and is itself derived genetically from an eoclimax. Manifestly we have here in Manicaland a panclimax of this sort (evergreen high forest) which is differentiated into three climaxes. The necessity for such a concept is apparent when one considers the difficulty of drawing a definite limit to the three climaxes discussed. They are in fact most easily defined in terms of the present predominant fire sub-climaxes. The further concepts of pre- and post-climaxes may be introducing difficulties. At any rate as far as the present study is concerned it would be exceedingly difficult to distinguish at times between a lociation and a pre- or post-climax. Thus the Gymnosperms, *Widdringtonia* and *Podocarpus*, although apparently forming a hydroseral lociation of the mountain forest may equally be a pre-climax relict from a colder climate.

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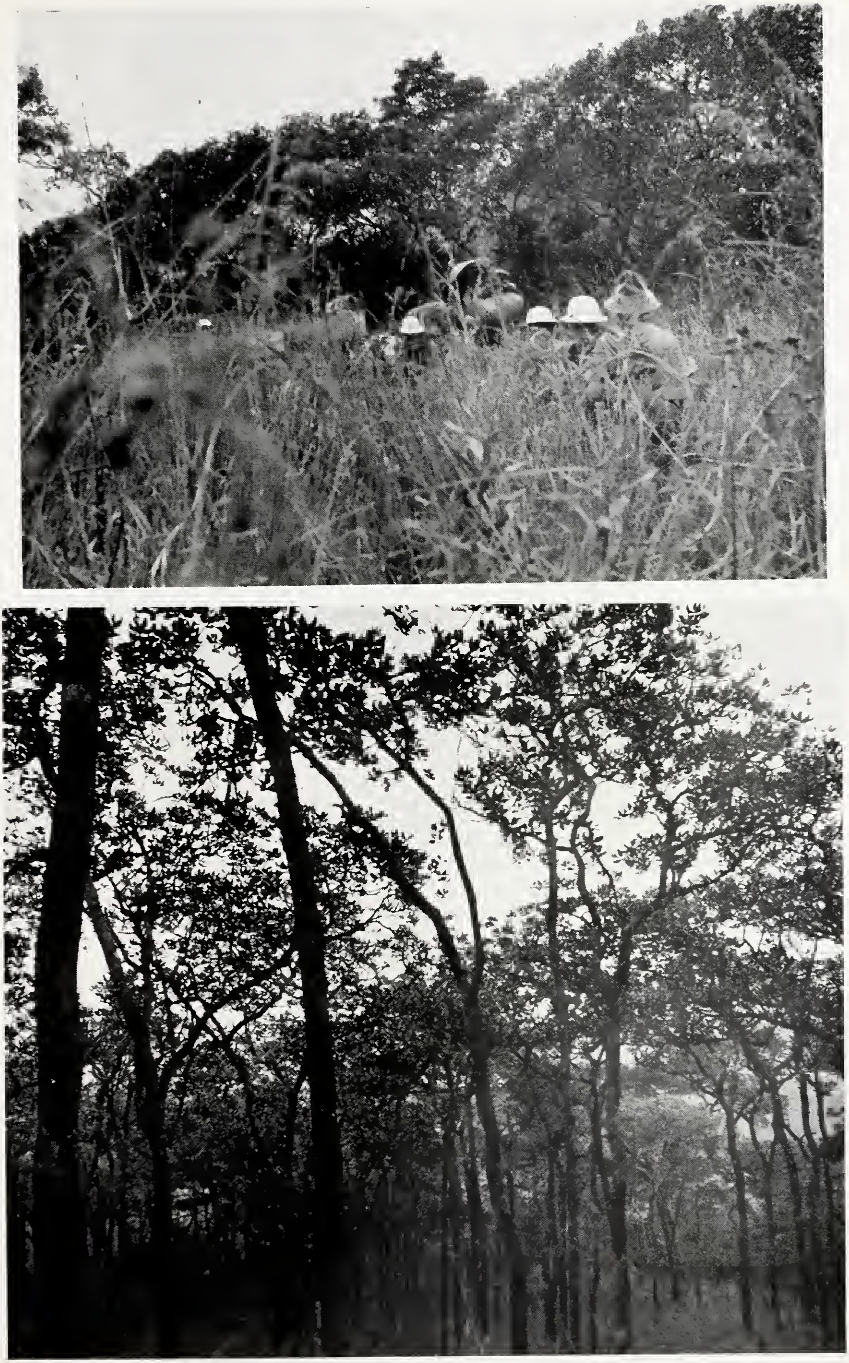


PLATE 12. (a) Tall grass stage (*Hyparrhenia cymbaria*) of secondary succession in muPfuti zone.
(b) Typical muJanje community in muPfuti zone.

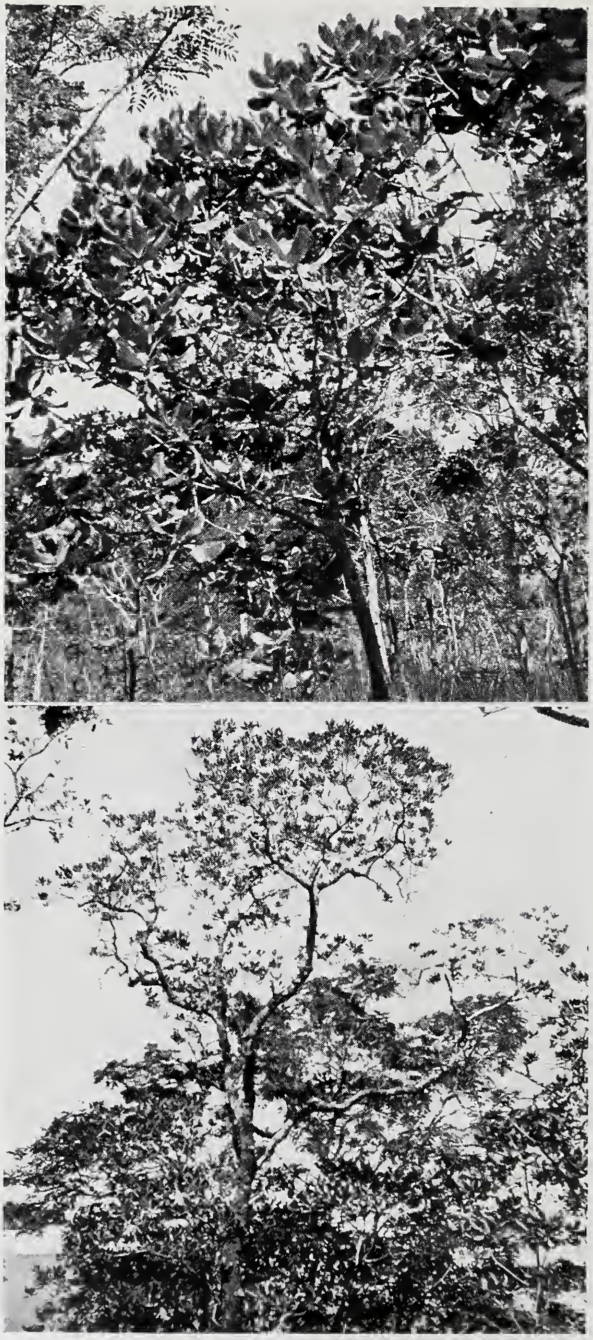
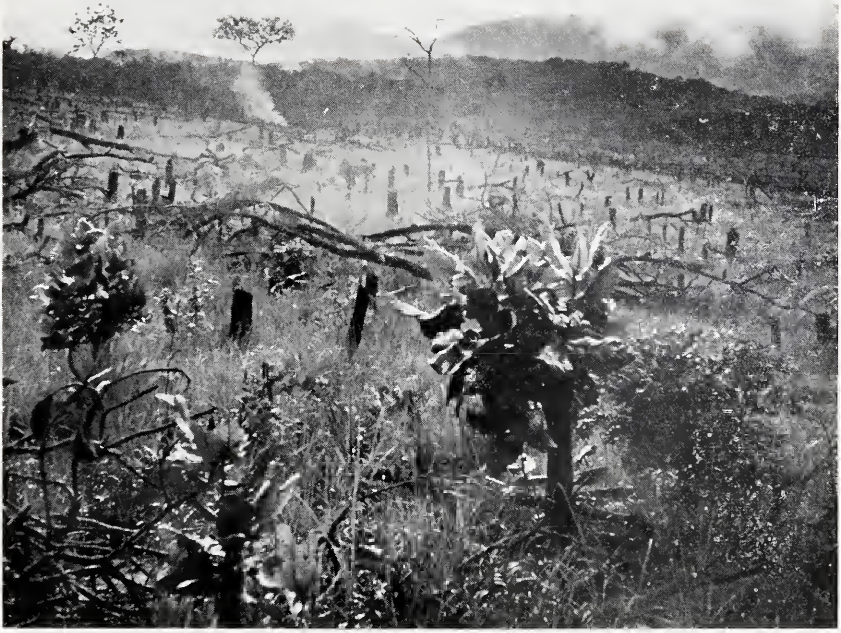


PLATE 13 (a) *Uapaca Kirkiana*, the muJanje, in the muPfuti zone.
(b) *Uapaca nitida*, the muTongoro, in the muPfuti zone.



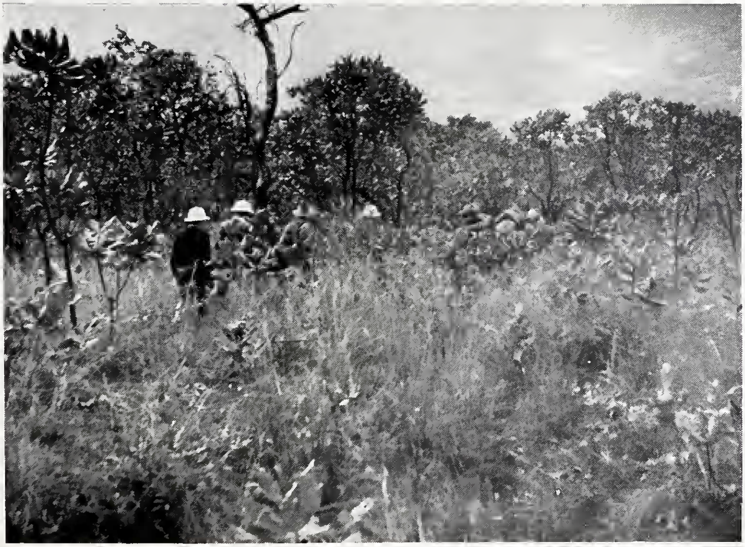


PLATE 14. (a) Field made by cutting and burning muJanje. Coppice of muJanje in foreground.

(b) Seedling muJanje invading *Hyparrhenia*. 8-10 year old trees behind.

PLATE 15. (a) Characteristic *Podostom* from the hydrosere in the muPfuti zone
(b) Solitary muChakati (*Parinarium*) surviving in the overtrampled environs of the dip-tank, Honde Valley.

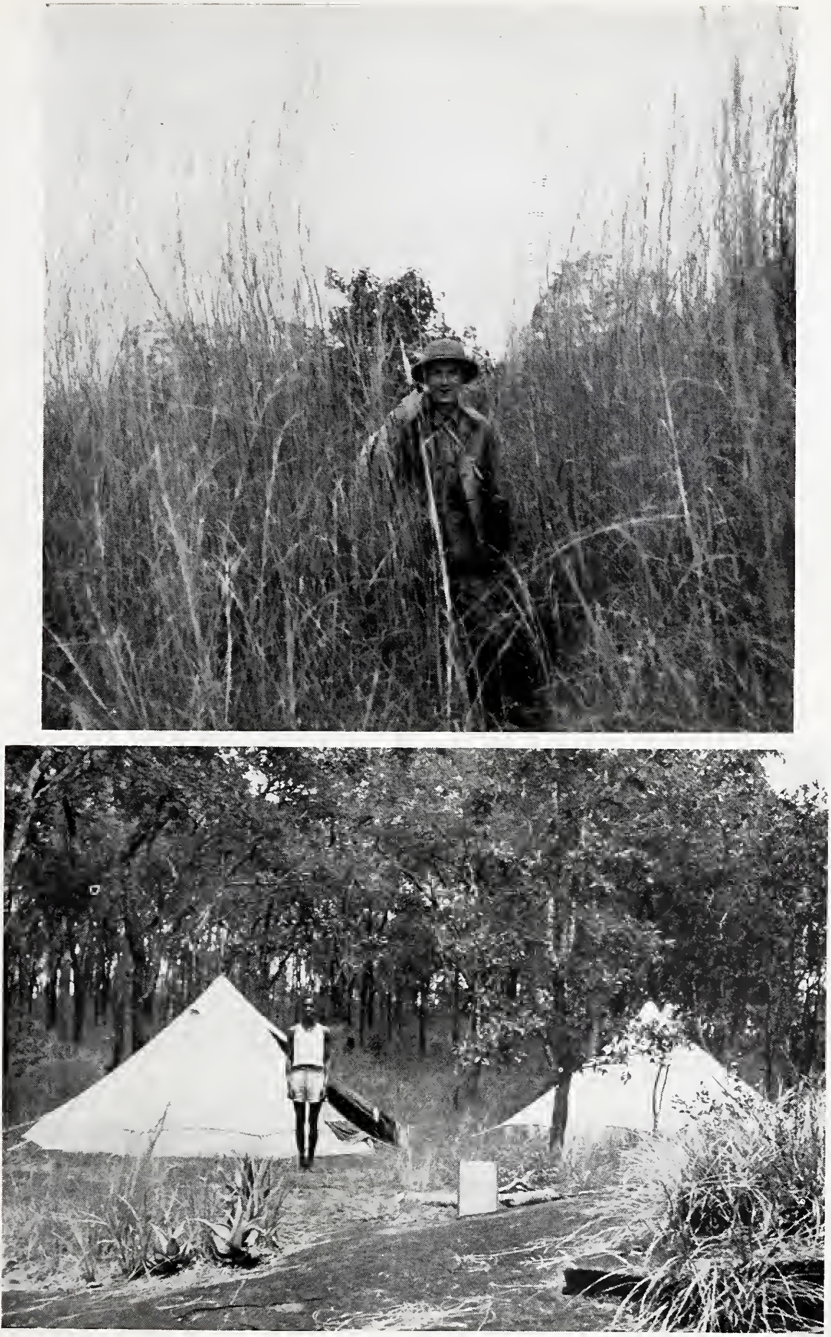


PLATE 16. (a) Tall *Hyparrhenia* in secondary succession stage of hydrosere in muPfuti zone.

(b) In foreground lithosere with *Aloe*. Behind typical Narwatsi community.

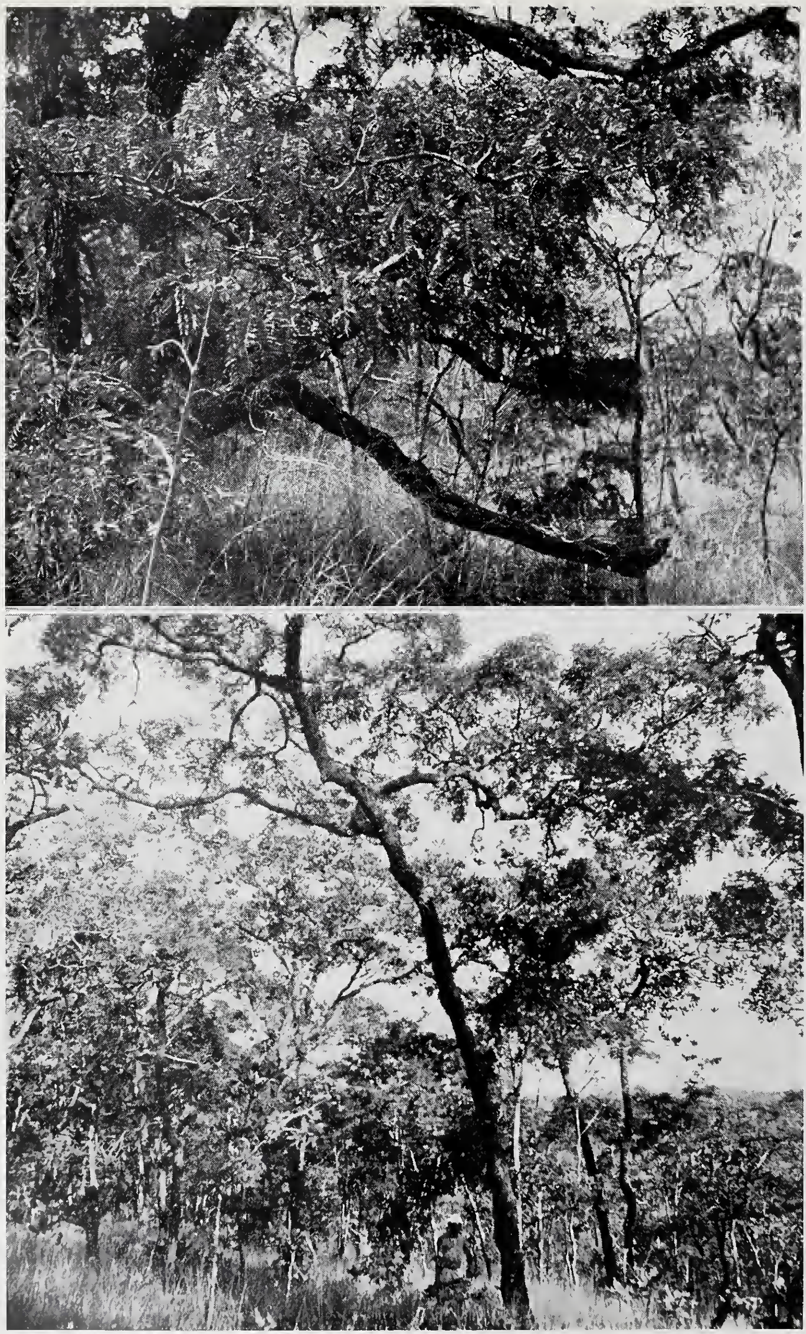


PLATE 17. (a) muPfuti (*Brachystegia flagristipulata*), Honde Valley.
(b) Narwatsi (*Brachystegia utilis*), Numkwarara Valley.

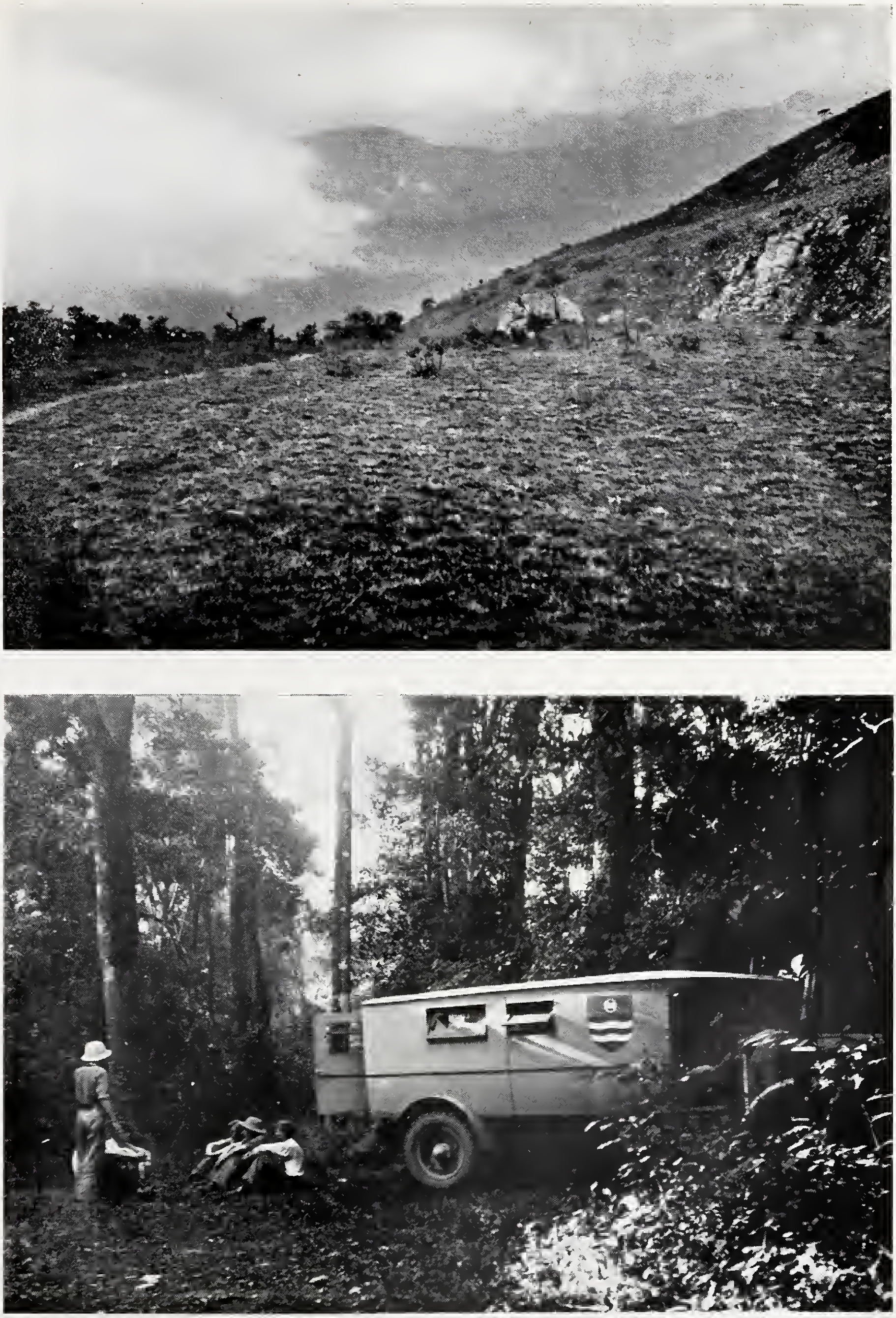


PLATE 18. (a) Upper limit of muTsatsa zone. Honde Valley escarpment. Dwarf muJanje and muTsatsa in middle foreground.
(b) Climax of subtropical evergreen high forest of muTsatsa zone. Mt. Selinda Forest, Gazaland.

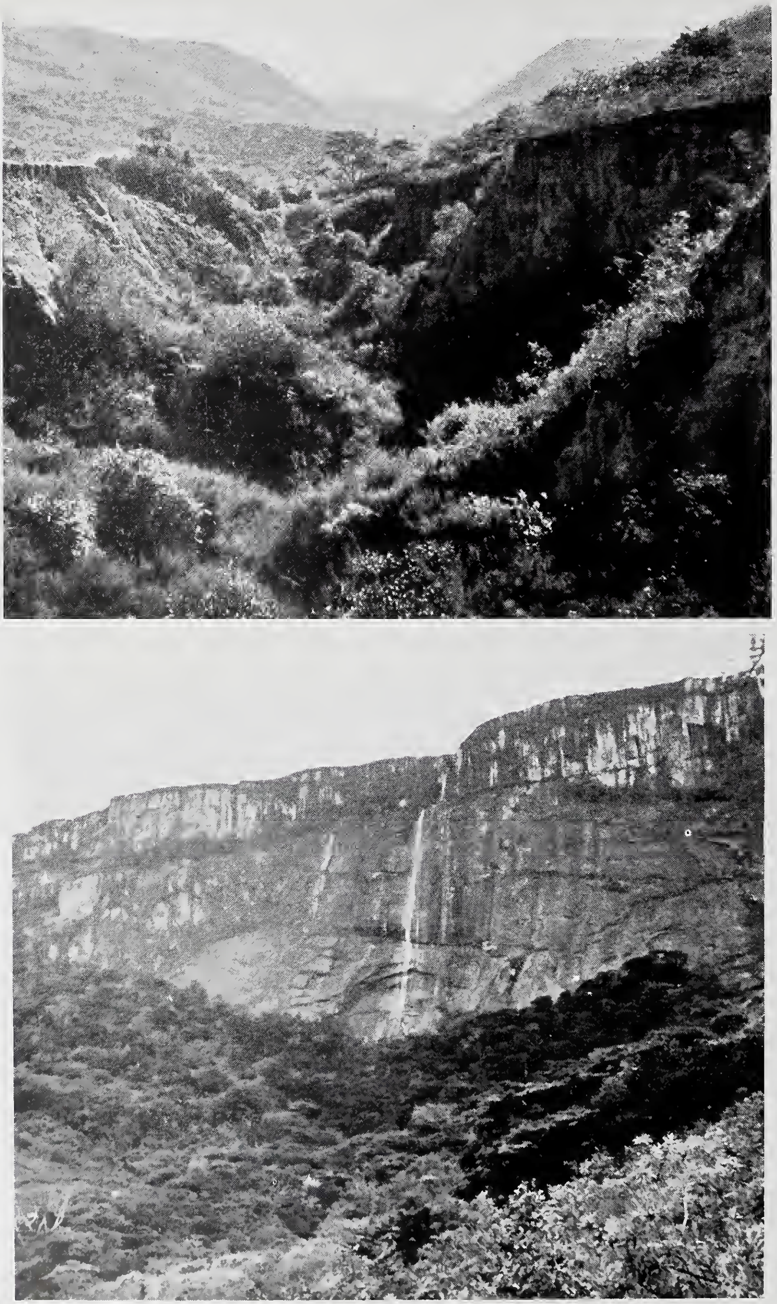


PLATE 19. (a) Kloof caused by erosion, 10 miles west of escarpment, containing *Rubus, Maesa, Myrica, Helichrysum, Stoebe*; typical ecotone plants of subtropical evergreen high forest.
(b) Canopy of the climax forest. Nyumterese Falls, Honde Valley.

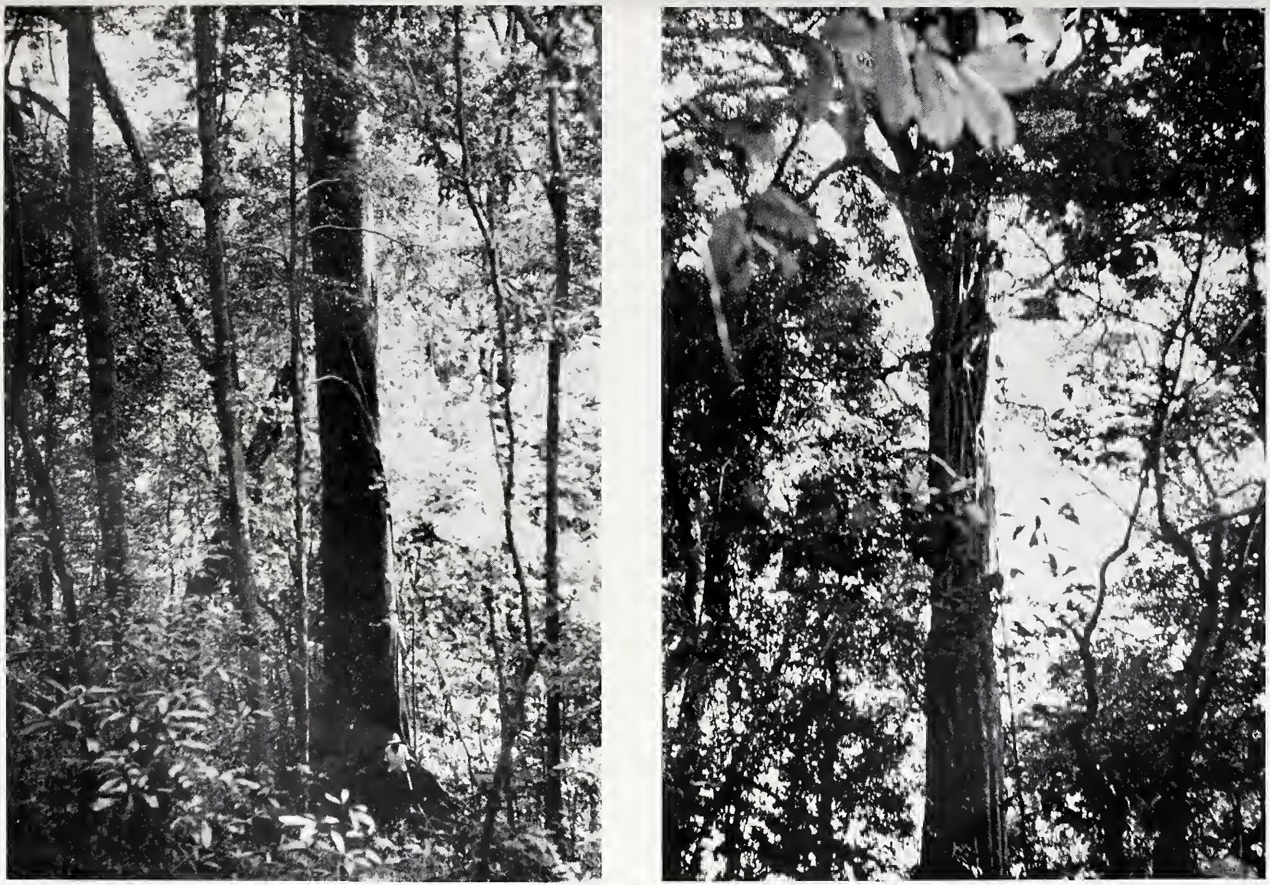


Plate 20.

(a) *Khaya nyassica* in Garuso Forest, Portuguese Manicaland.

(b) Typical "parasitic Fig" from Mt. Selinda Forest.

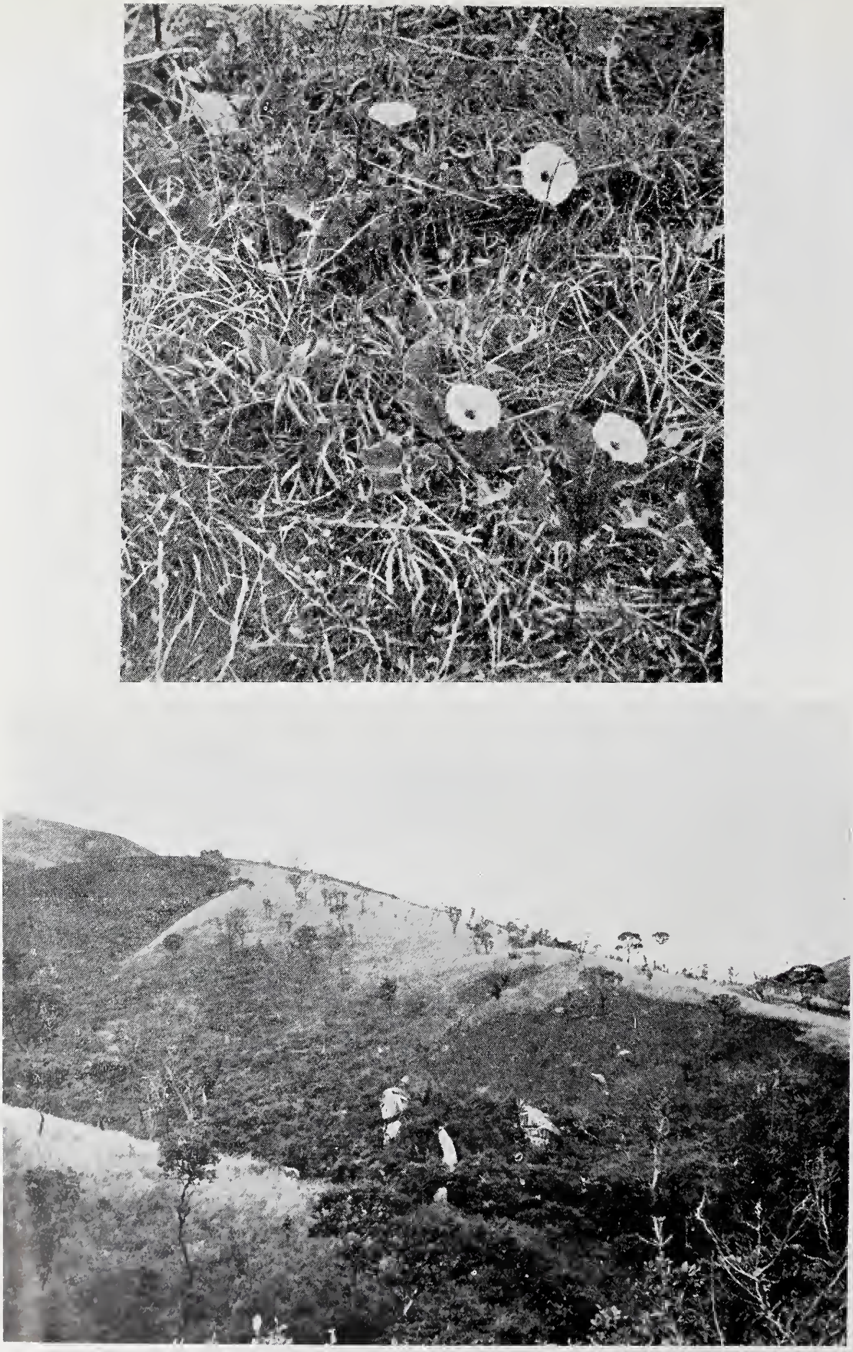


PLATE 21. (a) *Astrochlaena malvacea*, typical geophyte of disturbed veld in muTsatsa zone. From muOnga community, Penhalonga.
(b) *Trichopteryx* grassland of muTsatsa zone.

PLATE 22. (a) Community of *Hyparrhenia hirta* in secondary succession in muTsatsa near Inyanga.
(b) *Helichrysum Kraussi* community in secondary succession near Inyanga.

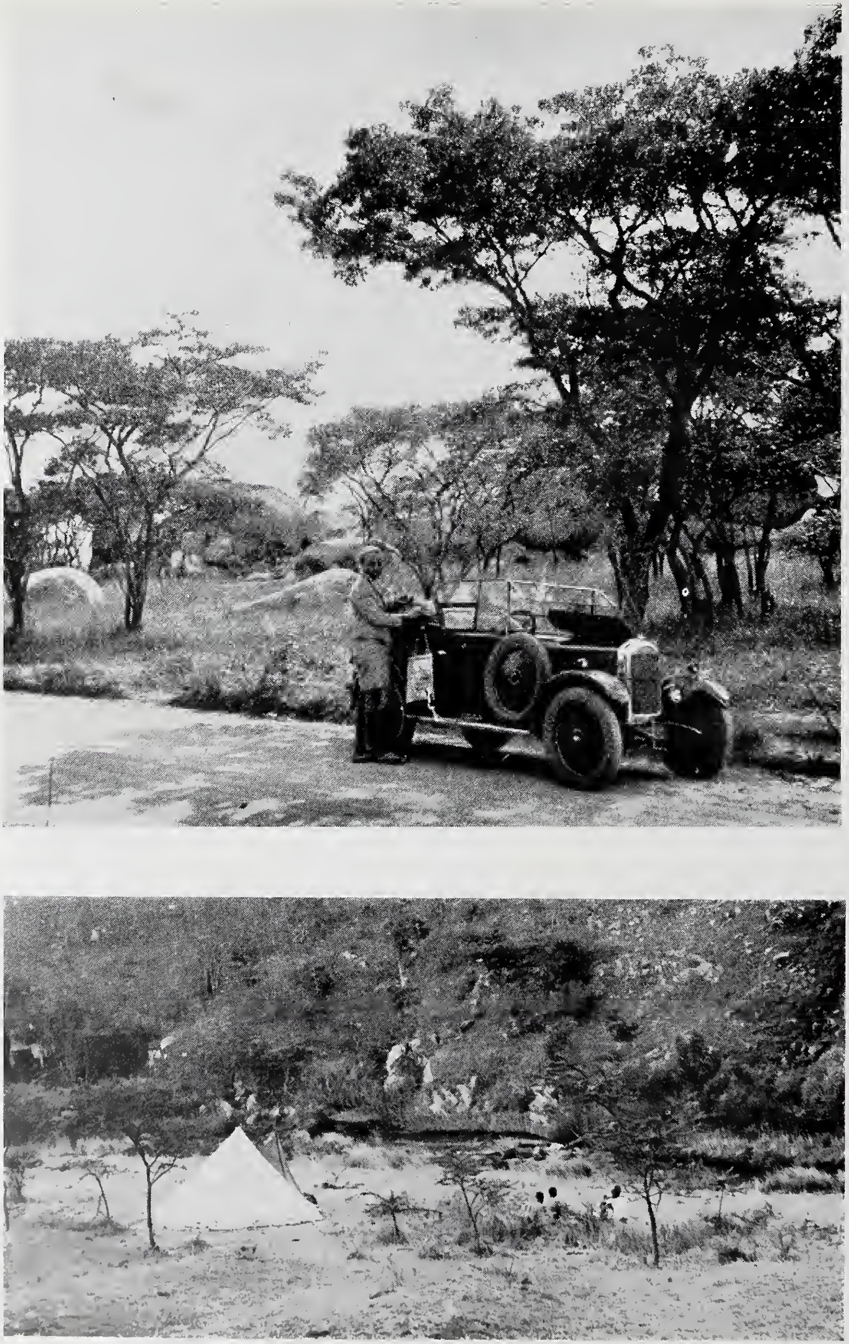


Plate 23. (a) muTsatsa (*Brachystegia Randii*) community ten miles east of Rusape.

(b) muOnga I community (*Acacia litakunensis*). Odzani River valley.

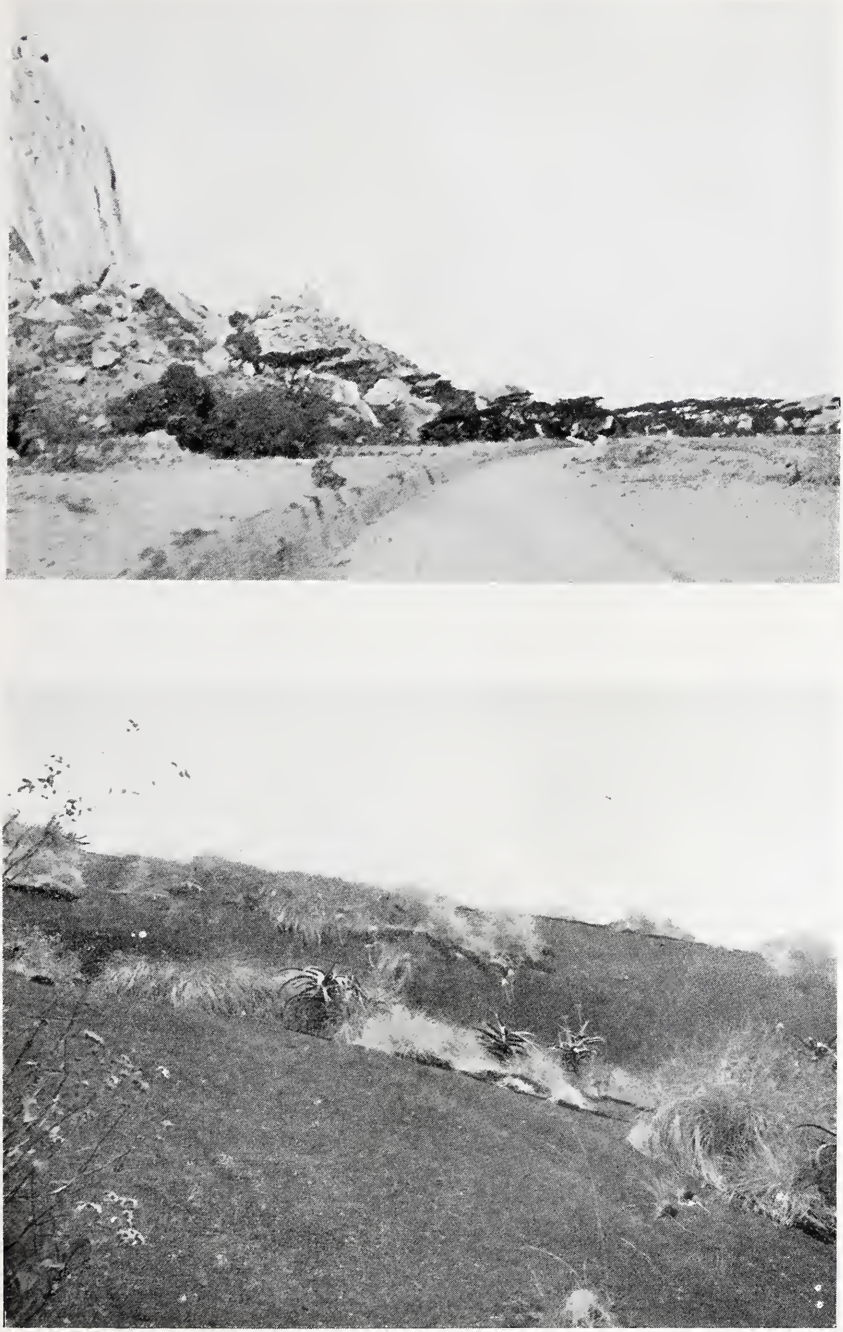


PLATE 24. (a) muOnga II community (*Acacia Rehmanniana*), Inyanga-Rusape road.
(b) Typical lithosere with *Aloe* in muTsatsa zone.

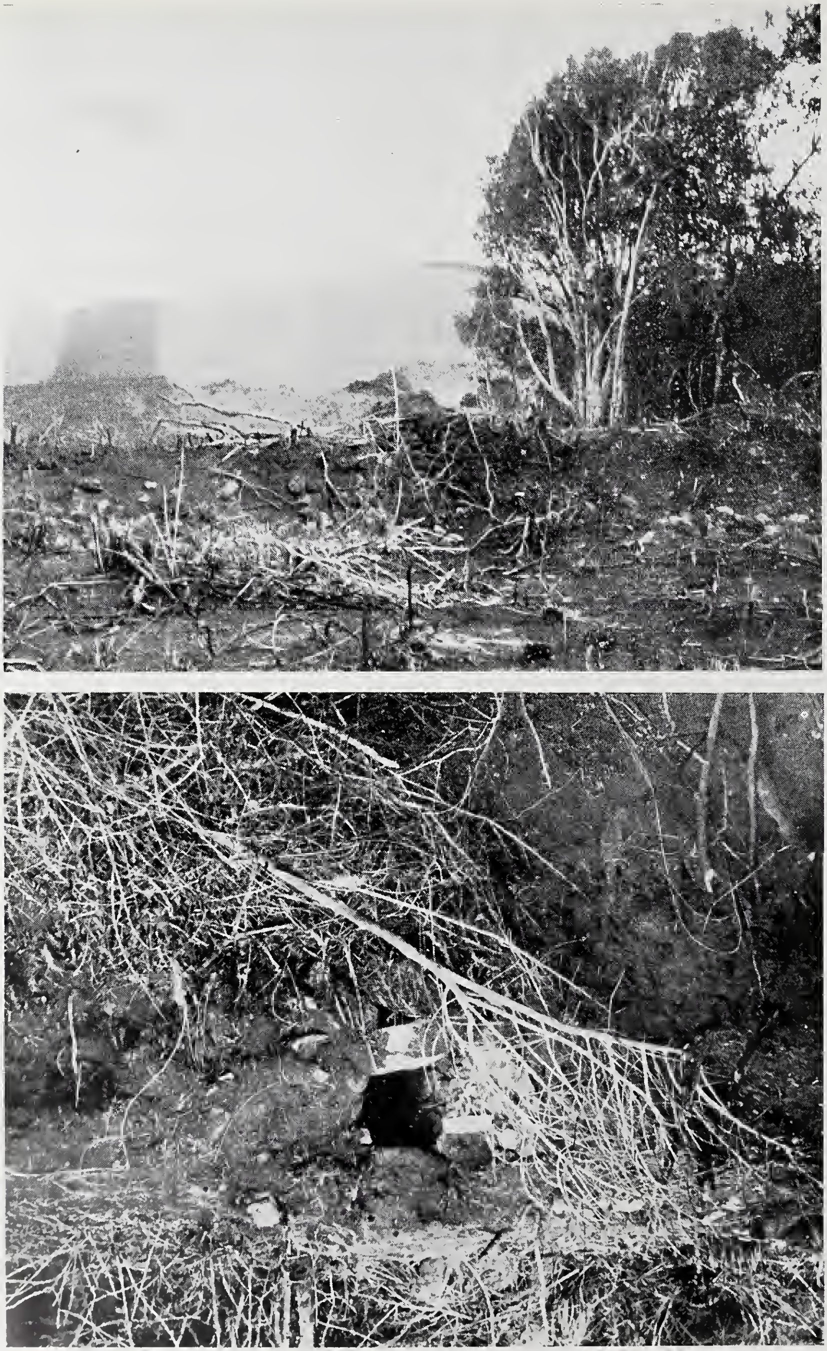


Plate 25. (a) " Slave pit " on Mt. Nuza showing invading vegetation (*Rapanea melanophleos, Cussonia spicata*).

(b) Cleared " pit " showing entrance and some of the accumulated debris.

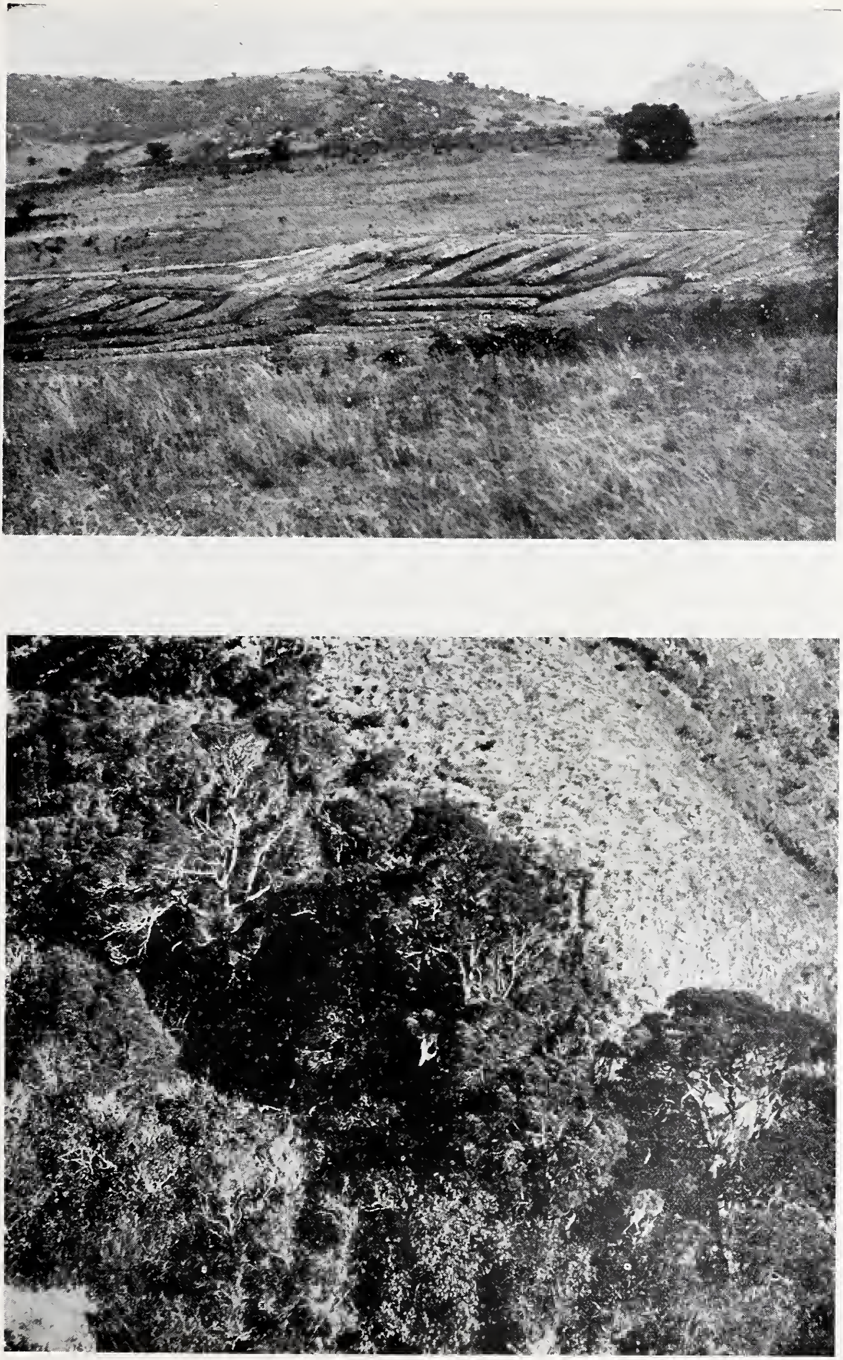


PLATE 26. (a) Small pumpkin and gourd garden on streambanks on western edge of mountain zone.
(b) *Widdringtonia milanjiana* (maPande) in streamside vegetation on Inyanga Downs.

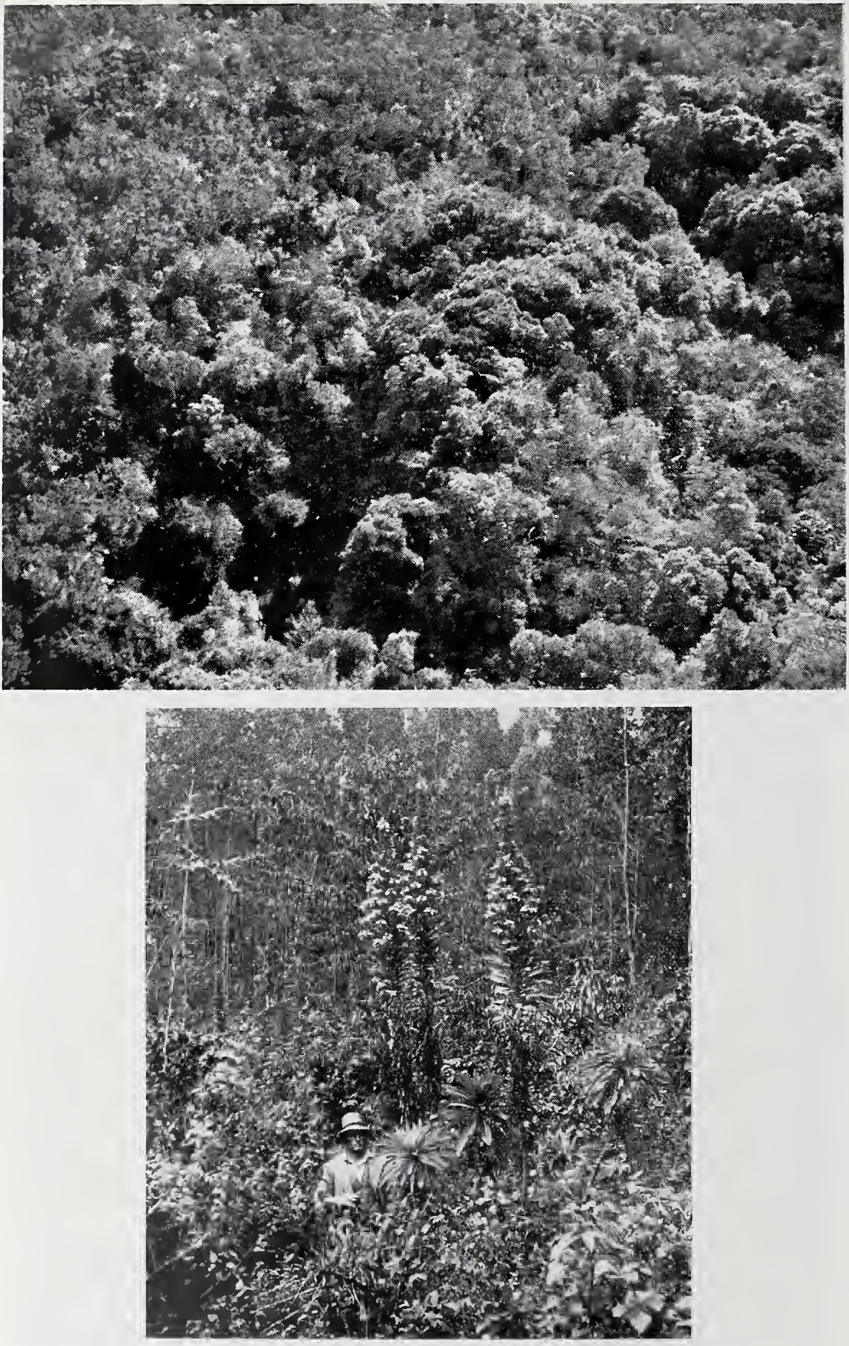
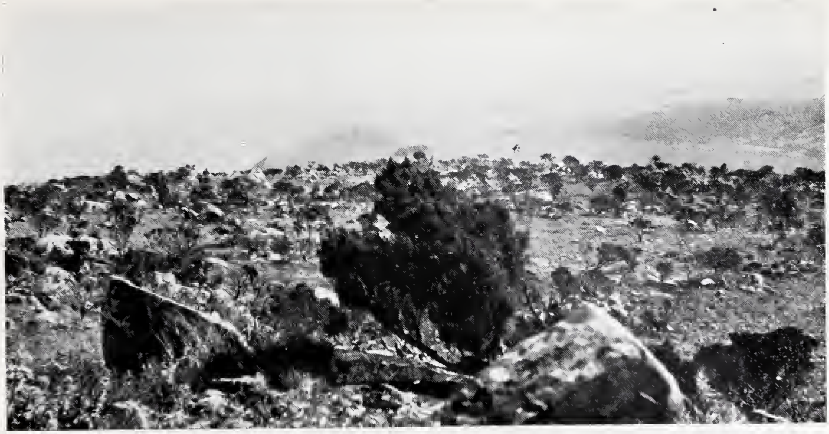


Plate 27. (a) Canopy of streamside forest in Nyumkombe Valley containing *Cussonia umbellifera*.

(b) *Lobelia Stricklandae* on banks of stream emerging from Ziwani Forest at lower limit of mountain zone.



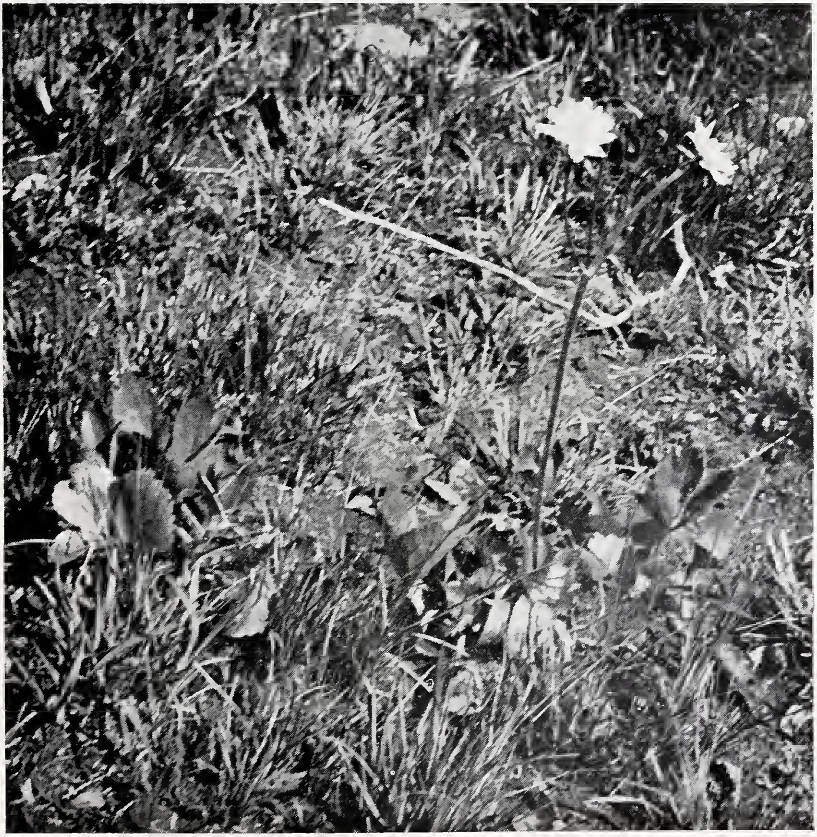


PLATE 28. (a) Xeroseral climax locies on summit of Mt. Inyangani. *Philippia-Protea* scrub.
(b) *Anemone peneensis* from summit of Mt. Nuza.

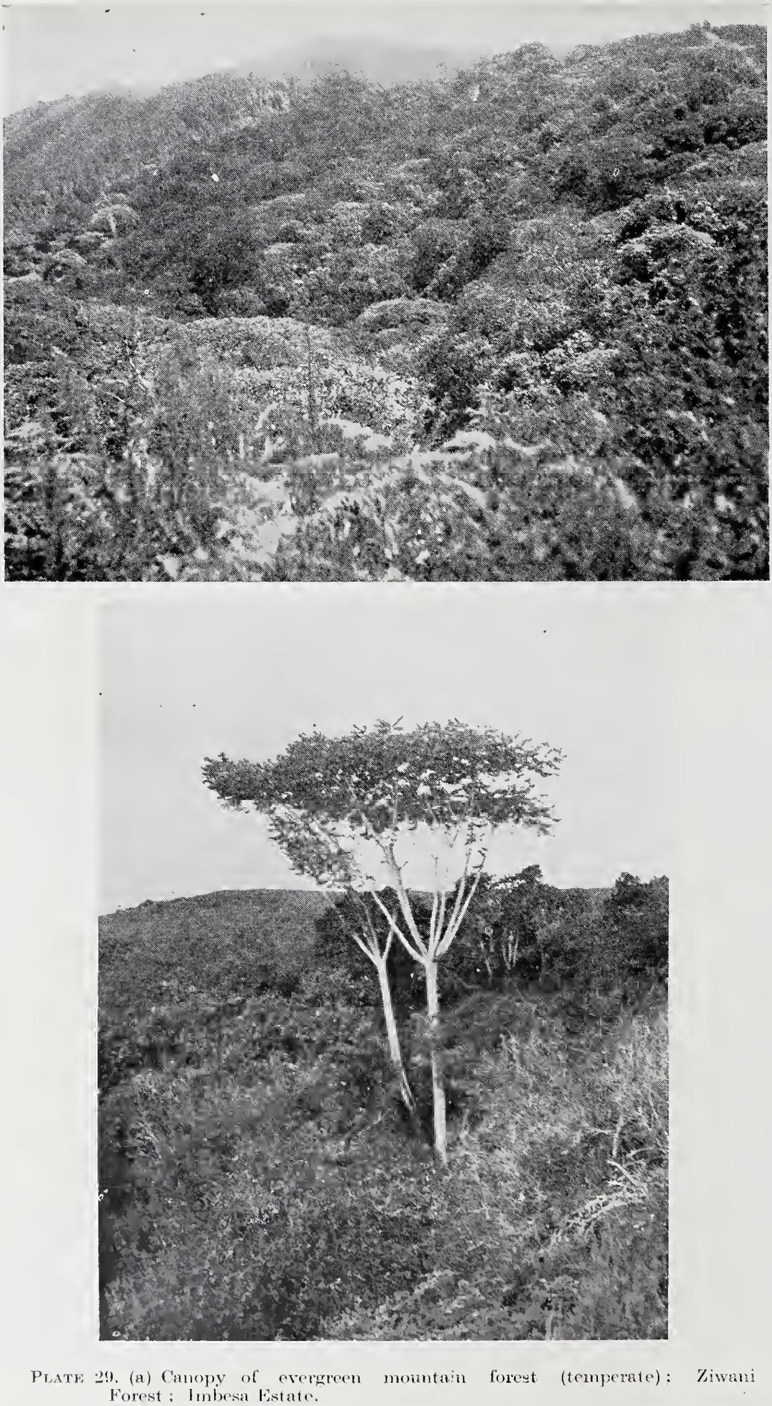


PLATE 29. (a) Canopy of evergreen mountain forest (temperate); Ziwani Forest; Imbesa Estate.

(b) *Polyscias*, the m'Tengembia from kloof forest on the north eastern slopes of Mt. Nuza.

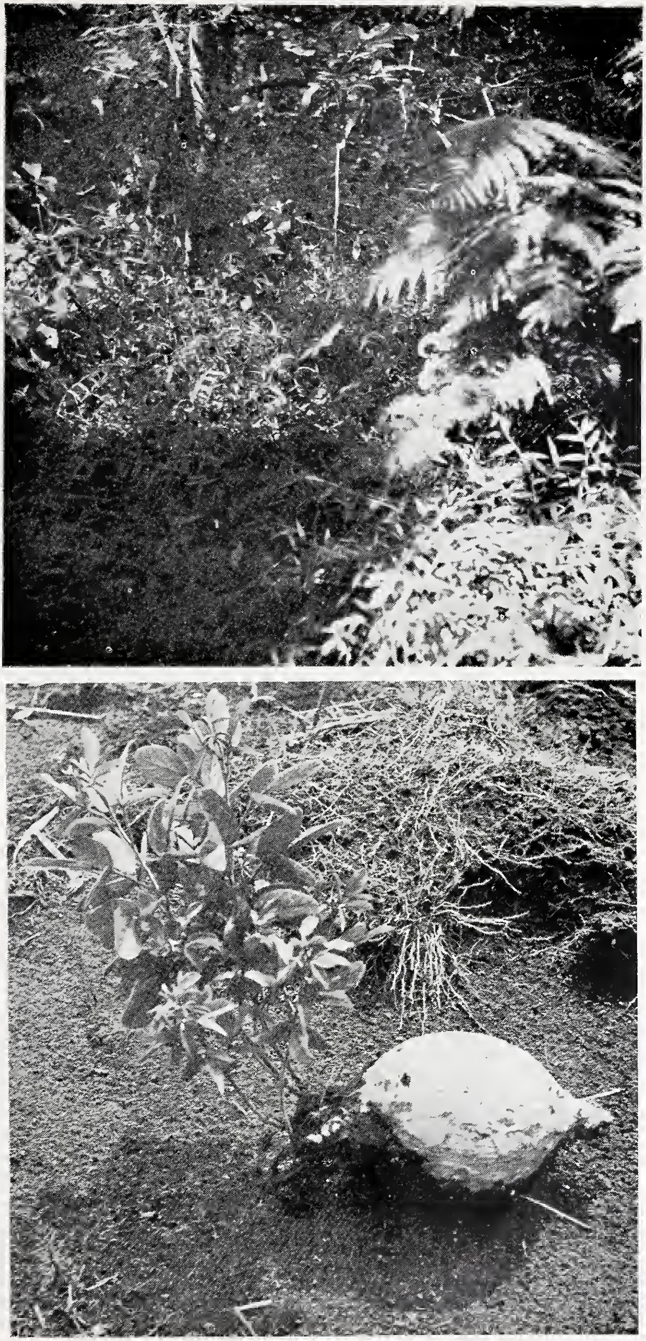
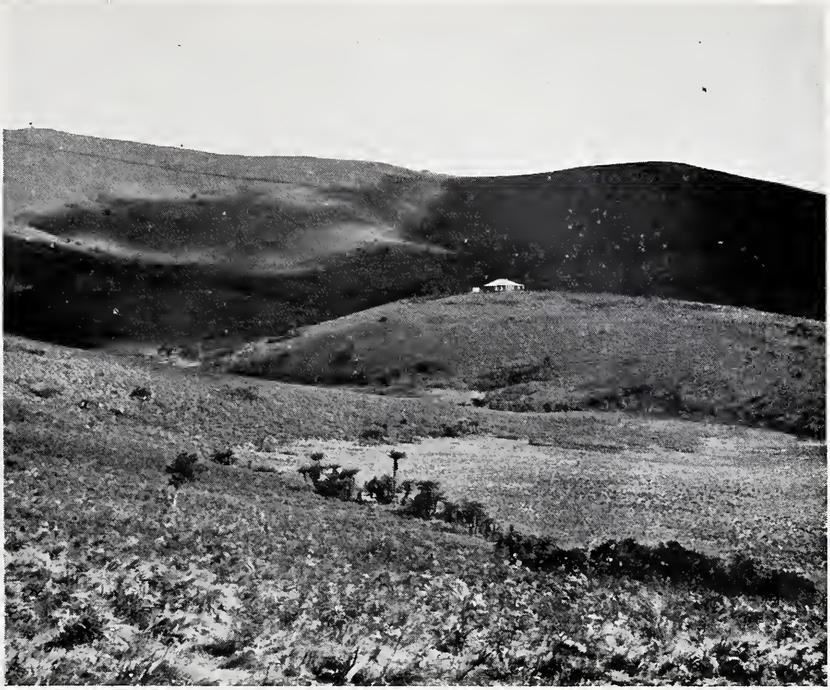


PLATE 30. (a) *Oplismenus africanus* in forest carpet of Ziwani Forest.
(b) *Dolichos Buchanani*, typical geophyte of mountain grassland.

Plate 31. (a) *Vernonia monocephala*, another mountain grassland geophyte. (b) Hydroseral community of slow running streambed of Mt. Nuza plateau. The Ainya (*Cliffortia*) community along tho water channel can be clearly distinguished.



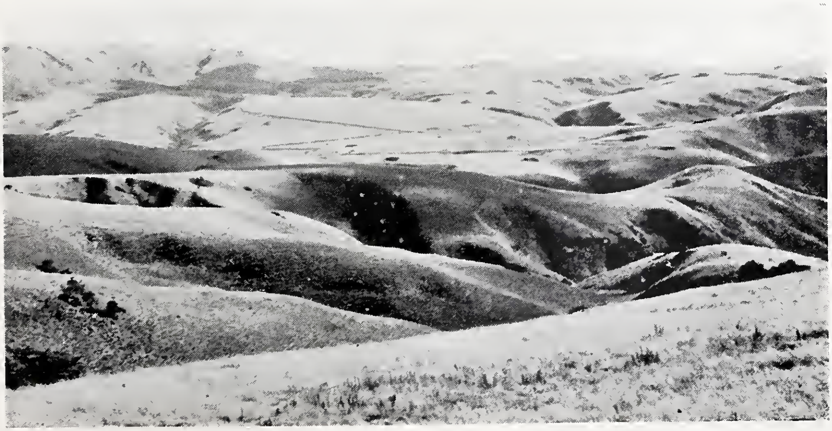


Plate 32. (a) *Cyathea Dregei* accompanied by *Hypericum leucoptychodes* forming the outer zone of the Hydroseral community.

(b) The mountain grassland (*Trichopteryx community*) at Inyanga Downs.

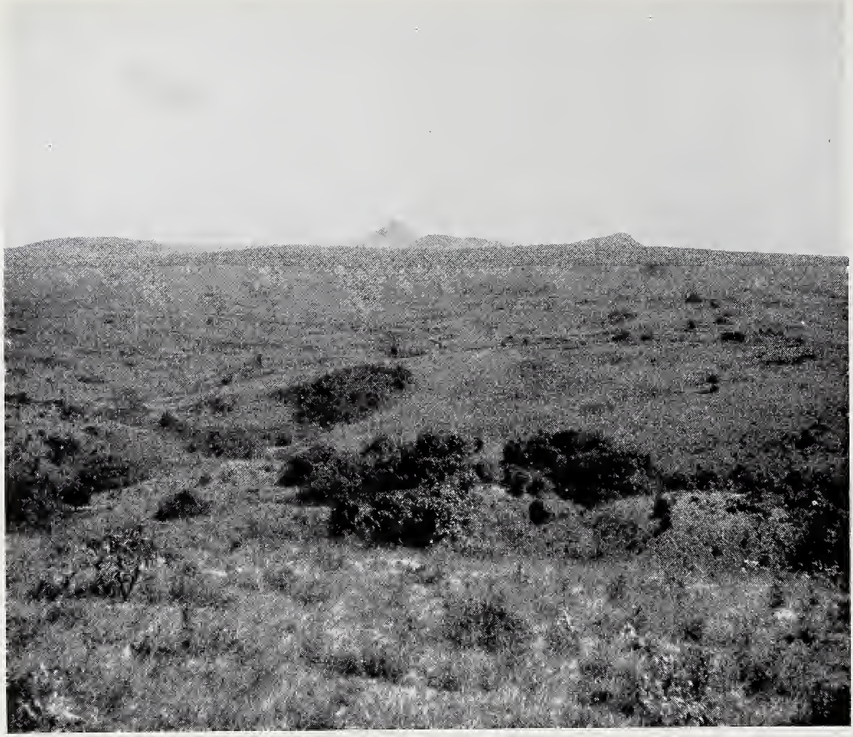
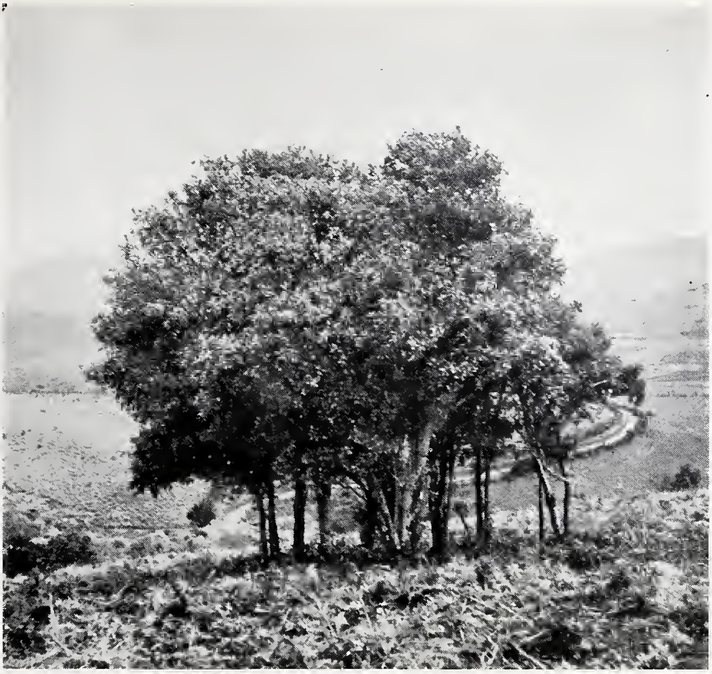


PLATE 33. (a) Invasion of mountain grassland by churu, Mt. Nuza plateau looking over towards Mt. Roonje.
(b) *Hypericum leucoptychodes*, flowering branch.



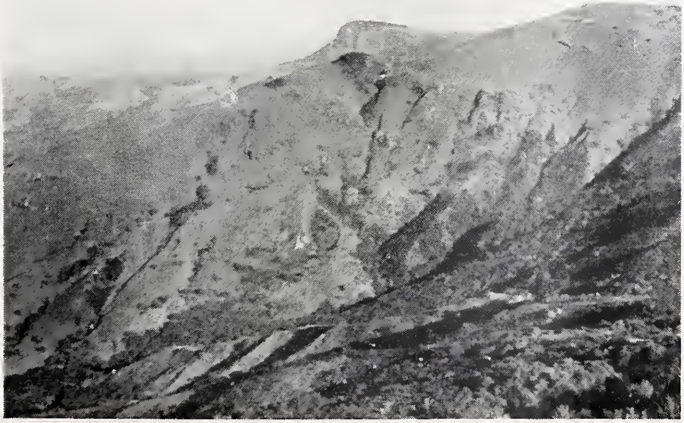
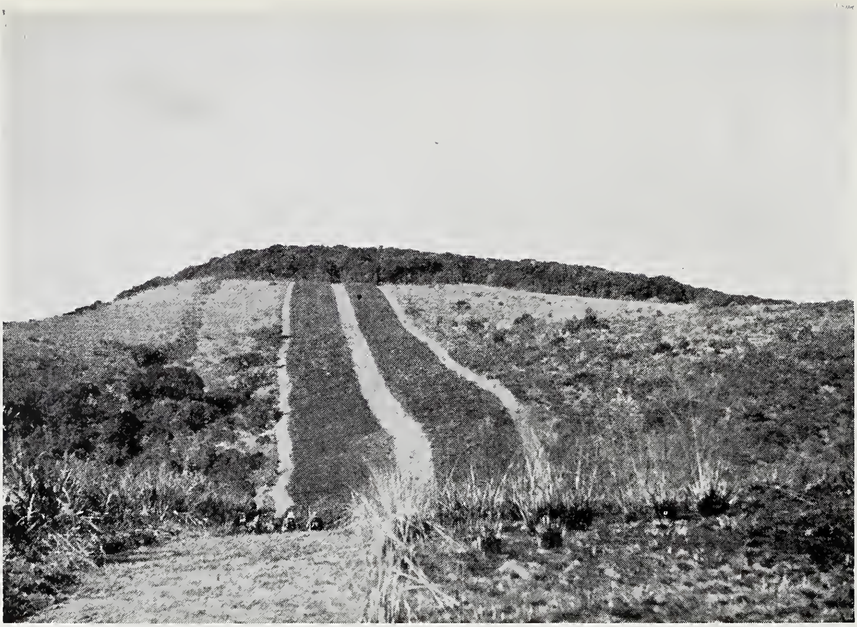


PLATE 34. (a) Fairly old churu cleared of all but central group of *Rapanea melanophloeos.*

(b) chiNyamariro forest from Mt. Rupere. The forest caps the cliff in the middle distance and the topographical fire protection (the prevailing wind is easterly, i.e., from the left of the photograph) is well seen.



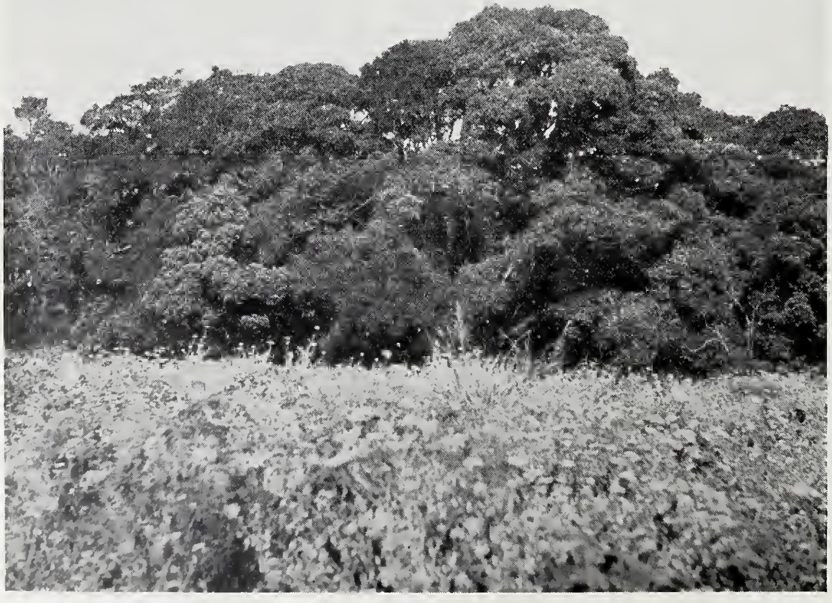


Plate 35. (a) chiNyamariro forest from the west.

(b) chiNyamariro forest ; closer view, showing the ecotone :—*Aphloia- Hypericum, Philippia-Helichrysum, Eragrostis.*